

Journal of the Society of Periodontists and Implantologists of Kerala



SOCIETY OF PERIODONTISTS AND IMPLANTOLOGISTS OF KERALA

OFFICE BEARERS

President Dr. Mathew Thomas Secretary Dr Mohammed Feroz T P Immediate Past President Dr. Jose Paul President Elect Dr. Arun Sadasivan First Vice President Dr Jayan Jacob Mathew Second Vice President Dr. Manikandan G R Joint Secretary Dr. Plato Palathingal Asst. Secretary Dr. Anish Varkey Treasurer Dr Jithin Balan Editor Dr Shahana C Mohamed Asst. Editors Dr. Lekshmi.A.J Dr. Deepthi.V Scientific Programme Convenor Dr. Deepak Thomas Scientific Program Co-Convenor Dr. Manju Babu Periodontal Health Convenor Dr. Subair.K Website Convenor Dr. Harikrishnan B Pillai Membership Committee Chairman Dr. Sameera G Nath EXECUTIVE **COMMITTEE MEMBERS** Dr Santhosh Sreedhar Dr Presanthila Janam Dr C K Ashokan Dr Harikumar Menon Dr Sanjeev Ravindran Dr Mohammed Shereef Dr Jeethu John Jerry Dr Linda Thomas Dr Sabu Kurien Dr Baiju R M Dr Tony Kurien Dr Vivek Narayanan Dr Sameer Dr Reshma Dr. Deepa Dilip ADVISORS Dr Thomas Thelly Dr Rezy Cheru Dr Meherunnisa Bai Dr K Nandakumar Dr H Shamsuddin Dr Kunjamma Sebastian EDITORIAL BOARD Dr K Nandakumar Dr Harish Kumar VV Dr Rosamma Joseph Dr Presanthila Janam Dr Bindu R Nayar Dr Biju Thomas REVIEW PANEL Dr Seema Jayakrishnan Dr Anuradha Bhaskar Dr Sajith Abraham Dr Anoop V Dr Roshni Ramesh

Vol. 16 | Issue 1 | March 2024

Index Copernicus ID 6818

Contents

| Secretary's Message3Editorial4Guest Editorial - Dr. K. Nandakumar5Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study7Sarah Alex, Jose Paul, Johnson Prakash D'Lima, Senny Thomas Parackal, Reshma TS7Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report12Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S17Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M17Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Sivana S, Arun Naravanan, Shabeer Ali K, P. Rizleena Maiced35 | President's Message | 2 |
|---|---|----|
| Editorial4Guest Editorial - Dr. K. Nandakumar5Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study7Sarah Alex, Jose Paul, Johnson Prakash D'Lima, Senny Thomas Parackal, Reshma TS7Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report12Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S17Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M17Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge Sivana S, Arun Naravanan, Shabeer Ali K, P. Rizleena Maiced35 | Secretary's Message | 3 |
| Guest Editorial - Dr. K. Nandakumar5Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study7Sarah Alex, Jose Paul, Johnson Prakash D'Lima, Senny Thomas Parackal, Reshma TS7Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report12Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S17Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M13Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview27Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Sivana S, Arun Naravanan, Shabeer Ali K P, Rizleena Majeed35 | Editorial | 4 |
| Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study7Sarah Alex, Jose Paul, Johnson Prakash D'Lima, Senny Thomas Parackal, Reshma TS7Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report12Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S12Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M17Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35 | Guest Editorial - Dr. K. Nandakumar | 5 |
| Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report12Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S17Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M17Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Sivana S Arun Naravanan Shabeer Ali K P Bizleena Maieed34 | Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study Sarah Alex, Jose Paul, Johnson Prakash D'Lima, Senny Thomas Parackal, Reshma TS | 7 |
| Herbal Therapy: A New Direction in Periodontics17Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M23Biting Back: Zika's Impact on Oral Health23Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education: A Comprehensive Overview27Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Siyana S, Arun Narayanan, Shabeer Ali K P, Bizleena Majeed35 | Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF) - A Case Report Swetha Satheeskumar, Senny Thomas Parackal, Jose Paul, Johnson Prakash D'Lima, Reshma T.S | 12 |
| Biting Back: Zika's Impact on Oral Health23Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S23Exploring Simulation's Role in Dental Education:27A Comprehensive Overview27Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar27Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Siyana S, Arun Narayanan, Shabeer Ali K P, Bizleena Maieed35 | Herbal Therapy: A New Direction in Periodontics Anusree Madhusoodanan, Mohammed Feroz T P, Deepthi V, Nikhila T.M | 17 |
| Exploring Simulation's Role in Dental Education:27A Comprehensive Overview27Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R NayarDentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge35Siyana S, Arun Narayanan, Shabeer Ali K P, Bizleena Majeed | Biting Back: Zika's Impact on Oral Health Anil Melath, Subair K, Arjun MR, Nanditha Chandran, Swathi S | 23 |
| Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge 35 Sivana S, Arun Narayanan, Shabeer Ali K P, Bizleena Majeed | Exploring Simulation's Role in Dental Education: A Comprehensive Overview Aiswarya Lekshmy S, T.K Krishna Priya, Bindu R Nayar | 27 |
| | Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge Siyana S, Arun Narayanan, Shabeer Ali K.P, Rizleena Majeed | 35 |
| | | |





President's message

Dear Esteemed Members SPIK,

It is with great pleasure that I extend my warmest greetings to each of you as we celebrate the release the latest issue of our journal. This publication stands as a testament to our collective dedication to advancing the fields of Periodontology and Implantology in Kerala.

I would like to take this opportunity to express my heartfelt appreciation to Dr. Shahana and her editorial team for their unwavering commitment and tireless efforts in meticulously selecting the manuscript and bringing forth this journal. Their dedication ensures that our community remains at the forefront of cuttingedge research and innovation.

As we delve into the pages of this journal, may we find inspiration, knowledge, and insights that propel us further on our journey towards excellence in patient care and professional development.

Thank you to all who have contributed to this endeavor, and may we continue to strive for excellence in our shared pursuit of advancing Periodontology and Implantology in Kerala and beyond.

Dr. Mathew Thomas President, SPIK





Secretary's Message

Welcome you all to the first issue of our Journal - 'JSPIK' of this current SPIK year.

I would like to congratulate the organizing committee of 16th SPIK Annual Conference held at Ernakulam on 10th & 11th February, 2024. Also, would like to extend gratitude all SPIK members for joining hands in making the programme a grand success.

A special word of appreciation to our dedicated Scientific Programme Convenor Dr. Deepak Thomas for timely conduct of all the scientific events. SPIK organized the prestigious Periodontology Scholarship Exam, at PSM Dental College, Akkikavu. SPIK congratulates Dr. Sanjeev Ravindran, the exam convenor, for the excellent conduct of the exam and expresses our gratitude to the expert panel of examiners.

Let me congratulate the Editor, Dr. Shahana C Mohamed for continuing in the office for one more term considering the indexing process of the journal.

I would like to express my sincere gratitude to my two Presidents, Dr.Presanthila Janam and Dr. Jose Paul for the memorable two years. I thank all the office bearers and executive committee members for their support. It is indeed a task for me to continue for another term to mobilize the society registration renewal and the temporary GST registration, for the benefit of our Society. Requesting the support of all esteemed members to fulfill the above formalities. I would like to extend my gratitude to Dr. Jithin Balan, Hon.Treasurer for continuing for one more term along with me.

His creative ideas and positive suggestions will definitely help to improve our SPIK activities, under the Presidentship of Dr. Mathew Thomas, who is one of the senior members of SPIK.

The current SPIK year started with an e-poster competition for the students on the occasion of National Periodontists day at Mahe Dental College on 23rd February 2024. On the occasion of International Gum Health Day a CDE programme is scheduled at Kannur Dental College, Anjarakandy.

Dr. Mohammed Feroz T.P Secretary, SPIK





Editorial

Greetings from the editor...

I am deeply honored and grateful to SPIK for extending their trust in me by offering the opportunity to serve another term as Editor of this esteemed journal. It is a privilege to continue contributing to the advancement of our society in this capacity.

First and foremost, I extend my heartfelt congratulations to Dr. Mathew Thomas on his appointment as our new President, along with his dedicated team. His leadership and vision will undoubtedly guide us toward further success and innovation in our field.

Special appreciation goes to our young and dynamic secretary, Dr. Mohammed Feroz T P, for his willingness to continue serving in this role for another term. His tireless efforts have been instrumental in driving SPIK's initiatives forward.

Furthermore, I extend a warm welcome to the new Assistant Editors, Dr Lekshmi A J and Dr Deepthi V, who have joined our team. Their expertise and enthusiasm will undoubtedly enrich the content of our journal and contribute to its continued excellence.

As we embark on this new chapter, I urge all our members to continue supporting JSPIK with their valuable scientific contributions. Your research and insights are integral to the vitality and relevance of our journal, and together, we can elevate JSPIK to new heights of excellence.

Dr Shahana C Mohamed Editor JSPIK



Guest Editorial

ARE WE DOING JUSTICE IN ASSESSING PERIODONTAL TREATMENT OUTCOMES?

Dr. Nandakumar K

Dean, Post Graduate Studies, Azeezia College of Dental Science & Research, Meeyannor P O, Kollam-04742722350 Ph. No: 9447066100 Email: nandakumardrk@gmail.com



Periodontal diseases are a diverse group of chronic oral inflammatory conditions caused by microbial symbiosis and the host immune response and characterized by progressive destruction of the tooth supporting apparatus. Treatment of periodontitis is challenging because of the complexity of the condition, lack of complete understanding of the best disease control method and the need for a determined oral hygiene care from the patient. The goals of periodontal therapy are to preserve the natural dentition, periodontium and peri-implant tissues; to maintain and improve periodontal and peri-implant health, comfort, aesthetics, and function. Management of periodontal diseases are carried out through various nonsurgical and surgical procedures. Treatment outcome measurements are very important to assess the effectiveness and prognosis of the therapy. However, a wide range of endpoints used are surrogate in nature and these endpoints have no direct correlation with the patient centered outcomes. Hence, a direct relationship of surrogate endpoints with true endpoints needs to be established.

Accurate diagnosis and treatment planning are fundamental requirements for effective

outcome-based patient care. Restoration of lost periodontal tissues is carried out by various periodontal non-surgical and surgical therapies. Though the advancement in diagnostic techniques allows the clinician/ researcher to measure the clinical, symptomatic and biochemical aspects after periodontal therapy, some critical patient related aspects still remain undetected. Assessment of therapeutic success by traditional ways therefore is inappropriate for correct assessment, evaluation of the outcomes. The outcome to these treatment modalities has been of great importance and has led to several discussions over the years. It is mandatory to properly evaluate the outcomes of the treatment because:

1. Periodontal diseases owing to its inherent characteristics is traditionally measured using surrogate markers like Probing pocket depth (PPD) and Clinical attachment level (CAL). Any positive changes in the patients clinical, physiological, radiological or biochemical parameters have been considered as treatment success. The advancement of diagnostic techniques has shown a deeper picture on this type of evaluation of success of periodontal therapy

5



i.e., critical evaluation parameters or signs of periodontal treatment success are missed during revaluation.

2. Gain in clinical attachment measured in millimeters have been considered as an important parameter in assessing treatment success, but this expression in millimeter value could not reflect on the actual gain obtained in a particular site.

Treatment outcomes should measure meaningful benefits and harms of interventions and are key to evaluating comparisons between interventions. It is mandatory to evaluate the outcome of the periodontal therapy to assess the success of the treatment. A wide variety of outcome measures have been employed in periodontal research. Surrogate outcomes which include clinical measures such as probing depth and clinical attachment level, radiographic outcomes such as bone level and other laboratory measures. In periodontal research few accepted endpoints are used frequently to assess the treatment outcome such as CAL and PPD in millimeter as they are believed to be the gold standard in evaluating the periodontal treatment outcomes. Even though evaluation of the treatment outcome was assessed by noting the post treatment tissue changes by various clinical parameters, periodontal attachment level measurement was taken as the gold standard in determining result of the therapy. The treatment outcomes in terms of clinical attachment level were calculated based on pre and post clinical attachment level measurements. Currently this clinical attachment level value is expressed in millimeter. The drawback of expressing pocket depth in millimeters is that the outcome measurement obtained from this value could not interpret the exact observation noted post operatively. In other words, by expressing the

periodontal pocket depth in millimeter value, could not reflect the actual treatment outcome in a treated site. Hence, it is desirable to develop a tool as an Index by which exact treatment outcome could be appreciated with clarity for the clinician as well as for the patients to understand the success of the treatment. An index {Periodontal Treatment Outcome Index (PTOI)} was hence developed, keeping in view of the above objective to get a better evaluation of the post treatment results.

The development of this index was mainly focussed on converting millimeter value into percentage score (0 to100%) and this percentage score was applied and grade was obtained as:

| Grade | Attachment gain (percentage) | Score |
|---------|------------------------------------|--------------|
| Grade A | 75 - 100 % | Excellent |
| Grade B | 74 - 50 % | Good |
| Grade C | 49 - 25 % | Satisfactory |
| Grade D | 24 - 1 % | Not |
| | | Satisfactory |
| Grade E | 0 % | Poor |

Using this index, a realistic expression of the treatment outcome in a site could be evaluated and a better expression of the treatment results can be appreciated by the patient in the same way as the clinician performing the treatment.

Hence, developing an index by modifying expression of clinical attachment values(millimeter) to percentage score and grade (A, B, C, D, E), a better expression of the treatment outcome could be achieved. Development of a more reliable research, with applicable endpoint evaluations is very important as it can lead to successful research outcomes that can be accepted in clinical practice.



Assessment of Awareness, Experience, and Attitude of Female Dental Students about Oral and Gingival Changes during Menstrual Cycle: A Cross-Sectional Study

Sarah Alex¹, Jose Paul², Johnson Prakash D'Lima³, Senny Thomas Parackal³, Reshma TS⁴

ABSTRACT

Background: Significant shifts in hormone levels play a crucial role in modifying the oral mucosa at various critical periods in life, including puberty, menstruation, pregnancy, and menopause. These hormonal adjustments result in variations in estrogen and progesterone levels, influencing the health of gingiva and the overall condition of the periodontal area in the mouth.

Objective: To analyse the awareness, experience, and attitude of female dental students about the oral and gingival changes such as gingival bleeding, gingival swelling, soreness, halitosis, burning sensation, aphthous ulcers, alteration in taste sensation, dryness of mouth and mobility during the menstrual cycle.

Materials and methods: The present study was conducted as a crosssectional study among the dental students of Kerala. A self administered, semi structured questionnaire consisting of 14 questions was used to assess the attitude and awareness of oral and gingival changes in female dental students during menstruation.

Results: Most participants (61.3%) had a menstrual cycle length of 28–30 days, and 80% reported experiencing psychological discomfort during their cycle. The study included 269 married women, 236 of whom had regular menstrual cycles. A small fraction was taking oral contraceptive pills (1.33%) or hormonal therapy for PCOD (1.6%) were excluded from the study. Regarding oral health, only 45.1% of participants noticed changes during their menstrual cycle, including aphthous ulcers (23.2%), gingival bleeding (32.6%), soreness of the gingiva (6.6%), and halitosis (58%). A minority experienced dryness of the mouth (6.6%), while most did not notice teeth mobility or a burning sensation in the oral cavity. Few sought medical advice (3.3%) or dental consultation (3.6%), and most did not take additional measures to address these changes.

Conclusion: This study concludes that while participants had knowledge about menstruation associated discomforts, they were uninformed about many oral changes that occur during the cycle.

Keywords: Cross-sectional study, female hormones, oral changes, periodontal health

Introduction

Oral cavity is a mirror to overall health and wellbeing of patients. However, it can be affected by the presence of various systemic diseases or conditions. One of the systemic conditions that affect the oral cavity is hormonal changes. In females, hormonal fluctuations occur at different stages of life during puberty, menstruation, pregnancy, or menopause.¹ These hormonal fluctuations lead to numerous alterations within the oral cavity in females. It may lead to different changes in the physiological and behavioural patterns of the body.² The two main female sex hormones are estrogen and progesterone. Receptors for both have been found in human gingiva.³

¹Postgraduate student, ²Professor and Head, ³Professor, ⁴Senior Lecturer, Department of Periodontics, Annoor Dental College and Hospital, Muvattupuzha, Kerala, India. Corresponding Author: Dr. Sarah Alex, E-mail: sarahkarott@gmail.com



The fluctuations in ovarian hormones can lead to multiple changes in the oral cavity like increased gingival bleeding, sensitivity, and tenderness which has been reported in young females during puberty and 3-4 days before menstruation. These issues resolve once menstruation has begun.3 Machtei et al., in their longitudinal, prospective study compared the periodontal status of premenopausal women at different times during their menstrual cycle. They concluded that many women reported an increase in gingival inflammation and discomfort associated with their menstrual cycle, especially during menses period.⁴ This is a crosssectional closed ended questionnaire based study that attempts to analyse the awareness and knowledge on oral and gingival changes that occur among the female dental students during menstrual cycle.

There is strong evidence that suggests that sex hormone levels may alter the inflammatory response to plaque which increases the risk of gingivitis and periodontitis. Since very limited data is available regarding this among the female dental students of Kerala, it is imperative to assess the oral and gingival changes during the menstrual period.

Materials and Methods

This cross-sectional study was conducted in the Department of Periodontology, Annoor Dental College and Hospital, Muvattupuzha, Kerala, India. The study included a target population comprising 400 healthy menstruating females (dental students) of age groups between 18-30 years who were willing to participate voluntarily.

Inclusion criteria:

- Participants of ages ranging 18 to 30 years
- Systemically healthy participants
- Participants with regular menstrual cycles

Exclusion criteria:

- Patients who are pregnant or lactating
- Under hormonal therapy for polycystic ovarian disease (PCOD)
- Those taking oral contraceptives

| Parameter | Frequency (%) |
|--|---------------|
| Duration of the menstrual cycle: | |
| Less than 28 days: | 91- 30.3% |
| 28-30 days: | 184- 61.3% |
| More than 30 days: | 25-8.3% |
| Do you experience any psychological discomfort during the cycle: | |
| Yes | 240- 80% |
| No | 60-20% |
| Do you experience any oral changes during the cycle: | |
| Yes | 181-45.1% |
| No | 119- 39.6% |
| How many days prior to the cycles do you notice these changes: | |
| The day before | 44- 11% |
| Three days before | 66-16.5% |
| 7 days before | 70-23.3% |
| During | 112-27.9% |
| 7 days after | 8-2.6% |
| Have you developed aphthous ulcers during the cycle: | |
| Yes | 93-23.2% |
| No | 70-17.5% |
| Do not know | 137-45.6% |
| | |
| Have you experienced bleeding in gums | |
| Yes | 98-32.6% |
| No | 202- 50.4% |

Table 1: Response to questionnaire



A self administered semi structured closed-end questionnaire was designed comprising of 14 questions. Questionnaire was anonymous to ensure the confidentiality and reliability of data. A web based online survey was planned using Google Forms- circulated using WhatsApp private messages and groups. The demographic data like age, marital status, medical and drug history (to rule out polycystic ovarian syndrome, thyroid dysfunction) was recorded. The questionnaire was available in English language only. Data was entered in Excel and analysed using IBM SPSS statistics version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, version 22.0 Armonk, NY, USA: IBM Corp.). The analysis of answers involved descriptive quantitative statistics, for example, frequency and percentage.

The objectives of the study were to analyse: oral and gingival changes such as gingival bleeding, gingival swelling, soreness, halitosis, burning sensation, aphthous ulcers, alteration in taste sensation, dryness of mouth and mobility.

Results

In the present study, a Google form was circulated among 400 female participants comprising different age groups ranging from 18 to 30 years, out of which 100 females who participated did not fill the form completely or complete the questionnaire or did not include in the inclusion criteria. Among the participants, 1.33% were taking oral contraceptive pills and 1.6% of them were taking hormonal therapy for PCOD, only two of them were pregnant or lactating, hence excluded from the study.

Hence, forms of 300 participants were considered for the statistical analysis. Maximum participants were in the age group of 21–25 years, i.e., 210 participants followed by 80 participants in the age group of 26–30 years. Only ten participants participated in the

| Have you experienced swelling and soreness of gums | |
|--|------------|
| Yes | 20- 6.6% |
| No | 215-53.1% |
| Maybe | 67-22.3% |
| Have you had alteration in taste sensation during the cycle | |
| Yes | 2-98% |
| No | 298-2% |
| Have you experienced bad breath during the cycle | |
| Yes | 174- 58% |
| No | 126- 42% |
| Have you had burning sensation in oral cavity during the cycles: | |
| Yes | 146- 48.6% |
| No | 154- 51.3% |
| Have you experienced signs of dryness of mouth: | |
| Yes | 20-6.6% |
| No | 280-93.3% |
| Have you experienced increased teeth mobility during menstruation: | |
| Yes | 1-0.3% |
| No | 295-98.3% |
| Not sure | 4- 1.3% |
| Have you ever consulted a dentist/physician in this regard: | |
| Dentist | 11- 3.6% |
| Physician | 10- 3.3% |
| No | 279- 93% |
| Do you do any additional measures to overcome these changes: | |
| Yes | |
| No | 10- 3.3% |
| | 290-96.6% |



age group of 18–20 years. Among the participants, 61.3% had a duration of 28–30 days' menstrual cycle and 80% had experienced psychological discomfortduring the cycle. Also, 269 were married women, 236 women had a regular menstrual cycle. No history of PCOD was reported by 97% of women, and 290 participants reported that they are not taking any medications for thyroid dysfunction.

When asked about experience of any oral changes during cycle, only 45.1% experienced oral changes. Participants reported that they did not experience altered taste sensation. Aphthous ulcers were experienced by 23.2% women and 32.6% of them had gingival bleeding. Soreness of gingiva was felt by 6.6% and 58% women had experienced halitosis. Only 6.6% of participants experienced dryness of mouth. Majority of the participants reported that they did not experience signs of teeth mobility or any burning sensation in the oral cavity. Also, 3.3% of participants consulted a doctor in this regard and 3.6% of them consulted a dentist. Most of the participants did not do any additional measures to overcome these changes (Table 1).

Discussion

Due to fluctuation in the hormones, women report multiple oral discomforts which could be burning sensation, bleeding of mucosa with minor irritation, redness of gums, recurrent oral ulcers, halitosis and even dryness of mouth. The oral changes encountered and reported in the present study were only about 27.9%, of which aphthous ulcers contributed to 23.2% of them, whereas a study conducted by Balan et al.⁵ showed 30% of the patients with aphthous ulcers. In the present study, the maximum participants were of ages between 21-25, 7.3% of them reported bleeding gums and 6.6% reported gingival swelling which is almost similar to results of study conducted by Kardalkar et al.²

In a study conducted by Gomes et al., only 4% of participants knew the correlation between oral health and menstruation, 6% noticed bleeding gums, and 26% reported discomfort and tender gums. In the present study, 32.6% participants reported bleeding gums. The microbial dental plaque induces tissue inflammation that may manifest and remain as gingivitis or proceed to periodontitis in certain patients.⁶

Shourie et al., in their study concluded that the

pre-existing gingivitis could be exaggerated by the sex hormones, however, these hormones have a very negligible effect on healthy periodontium and the significant effect of hormone and oral changes is uncertain.⁷

In the present study, no participants had experienced altered taste sensation. Halitosis was reported by 58% of the participants and majority did not have burning sensation in oral cavity during this period.

Gomes et al., reported 4% altered taste sensation, whereas Balan et al., did not report any cases with altered taste sensation. Among the participants, 6.9% took treatment for any oral-related changes during menstruation which was very negligible. According to Gomes et al 97% of the participants did not undergo any treatment and in the present study 93% of the participants did not consult a dentist or a physician for any treatment.^{5,6}

Conclusion

Due to fluctuations in the hormones during the menstrual cycle, women have reported multiple oral discomforts such as gingival inflammation, gingival bleeding, gingival swelling and soreness, halitosis, aphthous ulcers, etc. It can give us more insight into how female hormones influence periodontal health². The results from this study can help us in understanding the subtle changes that occur during this period both orally and physiologically. It can eventually help women understand the importance of maintaining good oral hygiene and have good menstrual hygiene practices. Since the present study focuses only on a subpopulation of the South Indian population, elaborate largescale studies will be required among this ethnic group.

Clinical Significance

The menstrual cycle is a stage in a woman's life characterized by numerous physiological alterations within the body. Different phases of the menstrual cycle exhibit distinct physiological responses and behaviours. There is strong evidence available suggesting that sex hormone levels may alter the inflammatory response to plaque which increases the risk of gingivitis and periodontitis. Since very limited data regarding this is available among the female population of Kerala, it is imperative to assess the oral and gingival changes during the menstrual period.



Conflict of Interest

No conflict of interest

Funding

No funding was obtained for this study

References

- Almutairi AS. Assessment of awareness, experience, and attitude of Saudi women about oral health changes during the menstruation: A cross-sectional study. Saudi Journal for Health Sciences. 2022 Sep 1;11(3):209-14.
- Kardalkar S, Kardalkar SB, Bhayya H. Assessment of attitude and awareness of oral health changes in females during menstrual cycle: A questionnaire-based survey. Journal of Dental Research and Review. 2021 Jul 1;8(3):194-9.

- Steinberg BJ. Women's oral health issues. J Dent Educ. 1999 Mar;63(3):271-5.
- Machtei EE, Mahler D, Sanduri H, Peled M. The effect of menstrual cycle on periodontal health. J Periodontol. 2004 Mar;75(3):408-12.
- Balan U, Gonsalves N, Jose M, Girish KL. Symptomatic changes of oral mucosa during normal hormonal turnover in healthy young menstruating women. J Contemp Dent Pract. 2012 Mar 1;13(2):178-81.
- Gomes SR, Tamgadge S, Acharya SS, Thapar PR, Patil RR, Khanapure SC. Awareness of oral health changes during menstruation: a questionnaire-based survey among adolescent girls. Dentistry and Medical Research. 2019 Jan 1;7(1):28-32.
- Shourie V, Dwarakanath CD, Prashanth GV, Alampalli RV, Padmanabhan S, Bali S. The effect of menstrual cycle on periodontal health - a clinical and microbiological study. Oral Health Prev Dent. 2012;10(2):185-92.

🕡 JSPIK

Treatment of Intrabony Defect in the Anterior Region using Allograft and Injectable Platelet Rich Fibrin (I-PRF)- A Case Report

Swetha Satheeskumar¹, Senny Thomas Parackal², Jose Paul³, Johnson Prakash D'Lima⁴, Reshma T.S⁵

ABSTRACT

While periodontitis primarily affects the periodontal tissues through infection, the changes occurring in the bone are critical as bone destruction leads to tooth loss. While horizontal bone loss is more prevalent, vertical bone loss presents a better opportunity for regenerative periodontal therapy. Recently, there has been a growing emphasis on the use of platelet-rich fibrin (PRF) to achieve predictable periodontal regeneration. PRF is a concentrated suspension of growth factors derived from platelets, which play a pivotal role in moderating wound healing and promoting tissue regeneration. This article presents case report of a patient with infrabony defects treated by combining PRF with allograft. The aim is to compare the clinical and radiographic outcomes achieved by this combination therapy.

Keywords: Intrabony defect, Platelet rich fibrin, Guided tissue regeneration, Allograft, Periodontal regeneration

Introduction

Periodontal therapy is commonly directed towards the restoration of damaged periodontal tissues, encompassing the function of the periodontal ligament, alveolar bone, and cementum. The preferred methods for achieving this include scaling and root planing (SRP) along with open flap debridement (OFD) surgery, aimed at eradicating pockets and facilitating the repair of periodontal tissues.¹

Following traditional surgical methods like open flap debridement, the restoration of lost periodontal attachment primarily involves the formation of a long junctional epithelium between the gingival flap and the previously affected root surface. Regeneration in periodontal therapy is defined as the process of reproducing or reconstructing a damaged part to restore the architecture and functionality of the periodontium. The objective of regenerative periodontal therapy is to rehabilitate both the structure and function of the periodontium. Achieving periodontal regeneration necessitates a coordinated series of biological processes, including cell migration, adhesion, growth, and differentiation. These processes are crucial for enhancing the success and predictability of periodontal regenerative procedures.² Several biomaterials can aid in the regeneration of lost tissues of the periodontium such as soft tissue grafts, bone grafts, guided tissue regeneration (GTR) or a combination.

Various bone grafts, including autogenous grafts, demineralized freeze-dried bone allografts (DFDBA), bovine bone xenografts, and synthetic bone substitutes have demonstrated regenerative capabilities and have been successfully employed in treating intrabony defects. The application of DFDBA, either independently or in combination with other treatment approaches for periodontal therapy, has consistently shown notable enhancements in both soft and hard clinical tissue parameters.³

A recent innovation in dentistry is the preparation and use of platelet-rich fibrin (PRF), a concentrated suspension of the growth factors found in platelets. These growth factors are involved in wound healing

¹Postgraduate student, ^{2,4}Professor, ³Professor and Head, ⁴Senior Lecturer, Department of Periodontics, Annoor Dental College and Hospital, Muvattupuzha, Kerala, India. Corresponding Author: Dr. Swetha Satheeskumar, E-mail: swetha.satheesk@gmail.com



and are postulated as promoters of tissue regeneration.²

In this case report, treatment of an angular defect in the upper anterior region using DFDBA (Rocky Mountain Tissue Bank), injectable platelet rich fibrin (i-PRF) and GTR membrane is discussed.

case report

A 13-year-old female patient, reported to the Department of Periodontics and Implantology with a complaint of occasional pain and pain while having food in the upper front tooth region for 1-2 months. Patient did not have any relevant dental or medical history and was not under any medication. Patient did not give history of any habits. On examination, the patient had gingival inflammation in relation to teeth 11 and 21 (figure 1a and 1b). A probing depth of 9mm was noted in the mesio-palatal aspect of 21. Tenderness on lateral percussion was noted in relation to 21. On radiographic examination, an angular defect of depth 10mm was noted in relation to mesial aspect of the 21 (figure 2). The patient was diagnosed to have localized periodontitis stage III grade A. Patient was advised to undergo oral prophylaxis and was reevaluated. The patient was further advised to undergo an open flap debridement treatment with placement of DFDBA, i-PRF and GTR membrane. Written informed consent was obtained following a discussion of risks and benefits of the procedure.

Surgical Procedure

Local anesthesia (lidocaine 1:1,00,000 epinephrine) 1.5ml was infiltrated buccally and 0.3ml was used for nasopalatine block in the palatal aspect for anesthetising teeth 22,21,11,12 region. Sulcular incision was given in relation to teeth 22, 21,11 and 12, buccally and palatally. Flap was elevated both buccally and palatally in relation to teeth 22,21,11 and 12 (figure 3a and 3b). Debridement and degranulation were done (figure 4a and 4b). Root conditioning was done in relation to tooth 21 using tetracycline hydrochloride(figure 5). DFDBA was placed in relation to the angular defect







Figure 1b: Pre-operative view -palatal aspect

Figure 2: Angular defect in relation to mesial aspect of tooth



Figure 3a: Sulcular incision and buccal flap elevation



Figure 3b: Sulcular incision and palatal flap elevation



Figure 4a: Degranulation and debridement done on buccal aspect



on the mesial aspect of tooth 21. For preparation of i-PRF, 13ml blood was obtained from the patient's cubital vein in the purple tube and was placed in the DUO Quattro PRF Centrifuge. The centrifugation was set at 700rpm for 5 minutes. After the centrifugation, the obtained i-PRF was then injected in relation to mesial aspect of tooth 21 (fig 6b,6c and 7b). GTR membrane was trimmed to conform to the defect and placed in relation to teeth 21 and 11 (figure 8b). Flaps were approximated using non-resorbable braided 3-0 silk sutures. (figure 9a)

Post-operative care

The prescribed care included capsule Amoxicillin 500 mg three times a day for 5 days; Mefenamic acid and paracetamol combination tablet, two times a day for 5 days; and 0.2% chlorhexidine mouthwash twice daily for one week. The sutures were removed after one week. Surgical wounds were cleaned with betadine solution, and the patient was advised to brush gently

with a soft toothbrush. Patient was also instructed on oral hygiene maintenance and was examined after three months. After three months, satisfactory soft tissue healing and radiographic bone fill was achieved. (figure 10a, 10b and 10c)

Discussion

The ideal goal of periodontal therapy is the reconstitution of bone and connective tissue attachment that has been destroyed by the disease process. Achieving complete regeneration of the periodontium following periodontal treatment modalities has proven challenging due to variations in the healing capacities among periodontal tissues. A wide array of treatment options exists, but only a subset can be considered truly regenerative procedures. As a result, dental research and industry have focused more intensely over the last two decades on biologically inert, synthetic, and autologous materials for implantation into periodontal intrabony defects.²



Figure 4b: Degranulation and debridement done on palatal aspect



Figure 5: root conditioning using tetracycline hydrogen chloride



Figure 6a: DFDBA



Figure 6b: DFDBA placed in relation to the intrabony defect mesial to tooth 11



Figure 7a: i-PRF



Figure 7b: i-PRF injected in relation to the mesial aspect of tooth 11

The present case report showed the clinical efficacy of PRF + DFDBA allograft in the treatment of intrabony defects in patients with significant improvements in clinical and radiographic parameters.

Platelet-rich fibrin (PRF) takes the form of liquid and can be combined with bone graft, providing numerous benefits such as enhancing wound healing, stimulating bone growth and maturation, stabilizing grafts, sealing wounds, controlling bleeding, and enhancing the manageability of graft material.²

Incorporating concentrated platelets into graft materials leads to a more reliable outcome. Platelet-rich fibrin (PRF) contains growth factors such as platelet derived growth factor (PGDF) and transforming growth factor beta (TGF- β), which facilitate protein synthesis in bone tissues, promote angiogenesis, and augment woven bone formation, among other functions.⁴

DFDBA has been used in periodontal therapy for years together. It is known to have an osteogenic potential that is manifested by exposing bone morphogenic proteins (BMPs) which presumably can induce host cells to differentiate into osteoblast. They have been successfully used to reconstruct intraosseous periodontal defects.²

JSPIK

Anuj Sharma et al.and Thorat et al. researched to investigate the clinical and radiographic efficacy of autologous platelet-rich fibrin (PRF) in managing intrabony defects in patients with chronic periodontitis. They observed a significant reduction in pocket depth, gain in clinical attachment level (CAL), and increase in bone fill at sites treated with PRF in conjunction with conventional open-flap debridement, compared to those treated with conventional open-flap debridement alone.^(5,6)

In their study conducted in 1987, Mellonig et al. assessed the efficacy of DFDBA in human periodontal defects. Group 1 received DFDBA treatment while Group 2 underwent only open-flap debridement. Evaluation was conducted six months postoperatively, revealing a 64.7% bone fill in sites treated with DFD-BA. The researchers concluded that DFDBA exhibits promising potential as a graft material for periodontal regenerative therapy.⁽⁷⁾



Figure 8a: GTR membrane customised



Figure 8b: GTR membrane placed onto the buccal and palatal aspect of teeth 21 and 11



Figure 9a: Sutures placed



Figure 10 a: Three month post operative view – buccal aspect



Figure 10 b: Three month post operative view – palatal aspect



Figure 10c: Radiographic appearance after 3 months



Simonpieri et al. outlined four benefits associated with the utilization of platelet-rich fibrin (PRF) during bone grafting. Initially, the fibrin clot assumes a crucial mechanical function by preserving and safeguarding the graft, while PRF fragments act as biological connectors among bone particles. Secondly, the fibrin network facilitates the migration of cells, vascularization, and sustains graft viability. Thirdly, growth factors such as PDGF, TGF- β , and insulin-like growth factor (IGF) are gradually released as the fibrin matrix undergoes resorption, fostering an ongoing healing process. Lastly, the presence of leukocytes and cytokines within the fibrin network can significantly contribute to the selfregulation of inflammatory and infectious processes within the grafted material.⁸

According to a systematic review and metaanalysis by Chen et al. based on the effectiveness in the use of PRF in the treatment of intrabony defects, the combination of OFD with PRF consistently outperformed OFD alone in reducing intrabony defect depth when compared both.⁹

According to Atchuta et al.in his study, combination of DFDBA and PRF yielded enhanced clinical and radiographic outcomes compared to the individual use of PRF or DFDBA alone. The combination of PRF with DFDBA was employed to leverage a synergistic effect in the treatment of intrabony defects among patients with chronic periodontitis.¹⁰

Bansal et al. and Khattar Sakshi et al. conducted studies to assess the effectiveness of autologous PRF combined with DFDBA in treating periodontal intrabony defects. Their findings indicated that the combination of PRF and DFDBA led to notable enhancements in clinical probing depth, relative attachment level, and radiographic bone fill.^{11,12}

The above-mentioned research demonstrates that PRF, whether used independently or in conjunction with bone graft, results in significant reductions in pocket depth, gains in clinical attachment level, and radiographic bone fill. However, the combination of PRF with DFDBA yielded more reliable outcomes.^{11,12}

A variety of regenerative techniques have been developed over time. It is crucial to acknowledge and utilize the advantages of each method appropriately. By doing so, patients can potentially experience maximum regeneration, ideally restoring tissues to physiological levels.²

Conclusion

Based on the case presented, it can be inferred that PRF demonstrates clinical and radiographic efficacy in treating periodontal infrabony defects. PRF, being an autologous preparation, proves to be clinically effective and cost-efficient compared to other available regenerative materials. Nonetheless, long-term, multicenter randomized, controlled clinical trials will be necessary to further validate its efficacy.

References

- 1. Dindarini R, Herawati D, Lastianny SP. The Effectiveness of injectable platelet-rich fibrin and bone graft addition to open flap debridement for infrabony pocket therapy. Majalah Kedokteran Gigi Indonesia;8(1):77-83.
- Bhedasgaonkar SY, Kapadia J, Patil NA. Treatment of infrabony defects with platelet-rich fibrin along with bone graft: Case report. Journal of the International Clinical Dental Research Organization. 2015 Jan 1;7(1):69-74.
- Vaid T, Kumar S, Mehta R, Shah S, Joshi S, Bhakkand S, Hirani T. Clinical and radiographic evaluation of demineralized freeze-dried bone allograft with concentrated growth factor versus concentrated growth factor alone in the treatment of intrabony defects. Medicine and pharmacy reports. 2021 Apr;94(2):220.
- Sunitha Raja V, Munirathnam Naidu E. Platelet rich fibrin: Evolution of a second generation platelet concentration Indian J Dent Res. 2008;19:42–6.
- Sharma A, Pradeep AR. Treatment of 3-wall intrabony defects in patients with chronic periodontitis with autologous plateletrich fibrin: A randomized controlled clinical trial J Periodontol. 2011;82:1705–17.
- Thorat MK, Pradeep AR, Pallavi B. Clinical effect of autologous platelet-rich fibrin in the treatment of intra-bony defects: A controlled clinical trial J Clin Periodontol. 2011;38:925–32.
- Mellonig JT. Decalcified freeze-dried bone allograft as an implant material in human periodontal defects Int J Periodontics Restorative Dent. 1984;4:40–55.
- Simonpieri A, Del Corso M, Sammartino G, Dohan Ehrenfest DM. The relevance of choukroun's platelet-rich fibrin and metronidazole during complex maxillary rehabilitations using bone allograft. Part II: Implant Surgery, prosthodontics and survival Implant Dent. 2009;18:220–9.
- Chen L, Ding Y, Cheng G, Meng S. Use of platelet-rich fibrin in the treatment of periodontal intrabony defects: a systematic review and meta-analysis. BioMed Research International. 2021 Feb 4;2021:1-3.
- Atchuta A, Gooty JR, Guntakandla VR, Palakuru SK, Durvasula S, Palaparthy R. Clinical and radiographic evaluation of platelet-rich fibrin as an adjunct to bone grafting demineralized freeze-dried bone allograft in intrabony defects. Journal of Indian Society of Periodontology. 2020 Jan 1;24(1):60-6.
- Bansal C, Bharti V. Evaluation of autologous platelet rich fibrin with the demineralized freeze dried bone allograft in the treatment of periodontal intrabony defects J Indian Soc Periodontol. 2013;17:361–6.
- Khattar S, Kaushik M, Tomar N. The use of platelet rich fibrin and demineralized freeze dried bone allograft in the treatment of intrabony defect-A case report Sch J Med Case Rep. 2014;2:563–7.



Herbal Therapy: A New Direction in Periodontics

Anusree Madhusoodanan¹, Mohammed Feroz T P², Deepthi V³, Nikhila T.M⁴

ABSTRACT

Periodontal disease is one of the major public health problems in the world and is the most common cause of tooth loss in population. Due to the infectious nature of periodontal diseases, patients with periodontitis can be treated with supplementary antimicrobials. The use of herbs in the treatment of periodontitis is growing as an adjunct to nonsurgical modes of treatment, either as single herb or polyherbal therapy.

Herbal medicine is both promotive and preventive in its approach and herbal medicines have fewer adverse effects. Plants have phytochemicals such as alkaloids, essential oils, flavonoids, and tannins that have strong antimicrobial activity and used as an antiinflammatory, antibiotic, analgesic, and antioxidative agents. This paper discusses the role of herbal therapy in the treatment and management of periodontal diseases.

Keywords: Periodontal disease, Phytotherapy, Antimicrobial resistance, Herbal medicine

INTRODUCTION

Periodontal disease is one of the major public health problems in the world and is the most common cause of tooth loss in population. Due to the infectious nature of periodontal diseases, patients with periodontitis can be treated with supplementary antimicrobials. The use of herbs in the treatment of periodontitis is growing as an adjunct to nonsurgical modes of treatment, either in single herb or polyherbal therapy.

Herbal medicine is both promotive and preventive in its approach and herbal medicines have fewer adverse effects. Plants have phytochemicals such as alkaloids, essential oils, flavonoids, and tannins that have strong antimicrobial activity and used as an antiinflammatory, antibiotic, analgesic, and antioxidative agents. This paper discusses the role of herbal therapy in the treatment and management of periodontal diseases.

HISTORY

Phytotherapy or phytomedicine has been a part of medical traditions for treating certain diseases since 200 B.C. The first written evidence of medicinal plant use was found in a clay board in the Sumerian culture. In India, medicinal plants have been used to treat patients' illnesses since 800 A.C. Hippocrates, the father of Greek medicine, depended on "natural" medicines to treat any kind of illness.¹ Since ancient times, many herbal plants have been used to treat and prevent certain diseases due to their curative properties. Plant-origin drugs have been extracted from barks, seeds, fruits, stems, roots, and other medicinal plants. There are approximately 500,000 plant species worldwide, of which only more than 2,000 plants were thought to have curative properties from ancient times.

In a review by Lewis and Elvin, they note a quotation credited to the prophet Muhammed: 'the Siwak (chewing stick) is an implement for the cleansing

¹Postgraduate student, ² Professor, ³ Reader, ⁴Senior Lecturer, Department of Periodontics, Kannur Dental College, Anjarakandy, Kannur, Kerala, India. Corresponding Author: Dr Anusree Madhusoodanan. E-mail: anusreemadhusoodanan39@gmail.com



of teeth and a pleasure to God.² The precise method for the use of this equipment was recorded by the Babylonians in 5,000 BC. The use of chewing sticks persists today among many African and southern Asian communities as well as in isolated areas of tropical America and the southern United States.² The oldest written evidence of medicinal plant's usage for treatment has been found on a Sumerian clay slab from Nagpur, approx. 5,000-year-old. It comprised 12 recipes for drug preparation referring to over 250 various plants, some of them are alkaloids such as poppy, henbane and mandrake.

The works of Hippocrates (459–370 BC) contain 300 medicinal plants classified by physiological action: wormwood and common centaury (Centauriumum bellatum Gilib) were applied against fever; garlic against intestine parasites; henbane, opium, deadly nightshade and mandrake were used as narcotics; fragrant hellebore and haselwort as emetics; celery, parsley, asparagus, sea onion and garlic as diuretics; oak and pomegranate as astringents.

PHYTOTHERAPY IN PERIODONTITIS

Periodontal disease is a chronic inflammatory condition which starts with gingival inflammation and progressively causes soft tissue destruction and tooth loss.² The periodontal pathogens associated with gingival and periodontal diseases are predominantly Gram-negative anaerobic microorganisms which include Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, Prevotella intermedia, Bacteroids forsythias, Fusobacterium nucleatum, Campylobacter rectus, Streptococcus intermedius, and Treponema species.¹ The herbs used for treatment of periodontitis are Acacia catechu wild, aloe vera (Aloe barbadensis miller) chamomile, Azadirachta indica, Glycyrrhiza glabra (Liquorice root), Cinnamomum zeylanicum, Allium sativum, Propolis, Mikania laevigata, Mikania glomerate, Drosera peltata, Helichrysum italicum, Coptidis rhizome, Piper cubeba, and Syzygium aromaticum. Tea tree oil (Melaleuca alternifolia) and Cordia verbenacea essential oils are some potential antimicrobial deriving agents used in the management of various periodontal diseases.³

A study done by A Jamil et al. 4 in 2011 concluded that garlic allicin extract has a potential use for prevention and treatment of periodontal disease. Results of the study showed that allicin inhibited growth of all tested bacteria (Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum, Streptococcus mutans, Escherichia coli, Streptococcus sobrinus and Actinomyces viscosus).

Various Herbs and their uses in the Management of Periodontal Disease

Turmeric (Curcuma longa)

Components present: Curcuminoids: Curcumin, dethoxy curcumin, and bisdemethoxycurcumin volatile oils (turmerone, atlantone, and zingiberene), sugars, proteins, and resins

Various actions of the components: Antibacterial, antifungal actions

Role in the management of periodontal diseases: Acts both as bacteriostatic and bactericidal for several pathogenic grampositive bacteria as well as gramnegative bacteria, subgingival irrigation reduces bleeding on probing and redness and pocket probing depth, massaging the teeth with roasted ground turmeric eliminates pain and swelling.

In a study by Suhag et al⁵ in 2007, it was seen that 1% curcumin solution can cause better resolution of inflammatory signs than chlorhexidine and saline irrigation as a subgingival irrigant. Mean Probing pocket depth reduction was significantly greater for the curcumin group than all other groups on all posttreatment days.

Behal et al⁶ in 2011 reported that the local drug delivery system containing 2% whole turmeric gel can be used as an adjunct to scaling and root planing.

Neem (Azadirachta indica)

Components present: Betasitosterol, nimbandiol, nimbolide and quercetin, Nhexacosanol and nonacosane

Various actions of the components: Astringent, antiseptic, insecticidal, antiviral, and antihyperglycemic

Role in the management of periodontal diseases: Broad range antibacterial activity and helps in plaque growth inhibition

The anti-plaque activity of neem chewing sticks is attributed to the fibrous nature of sticks resulting in mechanical plaque removal however neem plant also contains chemotherapeutic antiplaque agents.⁷ The



presence of Gallo tannins during the early stages of plaque formation could effectively reduce the number of pathogenic microbes from binding to the tooth surface by increasing their physical removal from the oral cavity through aggregate formation.⁷

The effective inhibition of glucosyl transferase activity and the reduced bacterial adhesion as seen with the presence of gallotannin extracts suggest some potential anti-plaque activity. Unlike antibiotics, antibacterial plant extracts produced no allergy in the gingiva that could inhibit their effectiveness.⁸

Tulsi (Ocimum sanctum)

Components present: Eugenol, caryophyllene, germareneA, clemene and caryophylline oxide Phytochemicals such as ursolic acid, rosmarinic acid and oleanolic acid

Various actions of the components: Antibacterial properties, immunomodulatory action

Role in the management of periodontal diseases: Effective against Grampositive and Gramnegative bacteria, immunomodulatory effect acts by increasing the levels of interferon, interleukin⁴ and T helper cells that will strengthen host response to infections.

Tulsi leaves when chewed raw help in maintaining oral hygiene. Carracrol and Tetpene are the antibacterial agents present in this plant. Sesquiterpene b caryophyllene also serves as the antibacterial agents. This constituent is Food and Drug Administration approved food additive which is naturally present in Tulsi.⁹ Tulsi leaves which are dried in sun and powdered can be used for brushing teeth. It can also be mixed with mustard oil to make a paste and used as toothpaste. Tulsi has also proven to be effective in counteracting halitosis.

Its anti-inflammatory property makes it a suitable remedy for gingivitis and periodontitis, and it can be used for massaging the gingiva in these periodontal conditions.¹⁰ Tulsi contains vitamin A and vitamin C, calcium, zinc and other metals. It also has chlorophyll and many other phytonutrients.

Pomegranate (Punica granatum)

Components present: Ellagic acid ellagitannins (including punicalagins), punicic acid, flavonoids, anthocyanidins, anthocyanins, and estrogenic flavanols

and flavones

Various actions of the components: Antiinflammatory, antimutagenic, and antifungal activity

Role in the management of periodontal diseases: Antibacterial properties against perio pathogens and antiplaque effect, significantly improves clinical signs of chronic periodontitis and lower interleukin1β And interleukin⁶ level.

Active components including polyphenolic flavonoids (e.g., punicalagins and ellagic acid), are believed to prevent gingivitis through several mechanisms including reduction of oxidative stress in the oral cavity, direct antioxidant activity, antiinflammatory effects, antibacterial activity, and direct removal of plaque from the teeth.⁹

In a study by Somu et al in 2012¹¹ evaluating the effects of pomegranate on gingivitis concluded that the pomegranate gel when used as an adjunct with mechanical debridement was efficient in treating gingivitis.

Aloe-vera (Aloe barbadensis miller)

Components present: Vitamins, enzymes, minerals, sugars, lignins, saponins, salicylic acids, and amino acids

Various actions of the components: Antibacterial, antioxidant, antiviral and antifungal actions

Role in the management of periodontal diseases: Local drug delivery system in periodontal pockets inhibit periodontopathic bacteria, it also reduces bleeding, inflammation, and swelling of the gums and acts as a powerful antiseptic.

Oliveira et al¹² in 2008 observed a significant reduction in plaque and gingivitis after a 30-day use of mouth rinse containing aloe vera with toothbrushing.

Acacia catechu Wild

This plant is used as mouthwash for gingival and throat infection like gingivitis stomatitis. The extracts of this plant have various pharmacological effects like antipyretic, anti-inflammatory, anti-diarrhoeal, hypoglycaemic, hepatoprotective, antioxidant and antimicrobial activities. Its antiplaque effect helps in preventing gingivitis.



A clinical study by Rani et al¹³ 2022 on a dentifrice herbal tooth powder containing acacia catechu reported that 87-95%, 70-72% and 80-95% reductions in plaque scores, gingivitis and dental calculus scores respectively after 15 days of treatment.

Grape seed extract

Components present: Polyphenolic compounds, mainly monomeric catechin and epicatechin, gallic acid, and polymeric and oligomeric procyanidins

Various actions of the components : Immunomodulator agent, antioxidant, anticarcinogenic, antiinflammatory effects.

Role in the management of periodontal diseases: Inhibit osteoclast differentiation, reduce osteoclast activity, and stimulate bone formation, bacteriostatic effect on the anaerobes

Rayyan et al.¹⁴ in 2018, conducted a study and found that Grape seed extract reduces gingival index and plaque index in chronic periodontitis patients.

A study by Toker et al.¹⁵ in 2018 found that Grape seed extract administration may reduce the inflammation of periodontium and alveolar bone loss by decreasing the levels of Matrix Metalloproteinases-8(MMP-8) and Hypoxia Inducible Factor- 1α (HIF- 1α).

Pineapple

Components present: Bromelain

Various actions of the components: Fibrinolytic, antiedematous, antithrombotic, and antiinflammatory, antibacterial

Role in the management of periodontal diseases: Antibacterial efficacy against all the isolated strains of both aerobic and anaerobic microorganisms (*Streptococcus mutans*, *Escherichia coli*, *Porphyromonas* gingivalis, and Aggregatibacter actinomycetemcomitans)

Tadikonda et al¹⁶ in 2017 proved the anti-plaque and anti-gingivitis efficacy of a dentifrice containing bromelain.

Guava

Components present: Vitamins, tannins, phenolic compounds, flavonoids, essential oils, sesquiterpene alcohols, and triterpenoid acids

Various actions of the components: Antioxidant, antiinflammatory, antispasmodic, anticancer,

antimicrobial, antihyperglycemic, and analgesic

Role in the management of periodontal diseases: Guava has antibacterial activity against both Grampositive and Gramnegative bacteria. The antiinflammatory action of guava is because of its ability to inhibit prostaglandin (PG), kinin, and histamine. It also has immunomodulatory activity on Nuclear factor kappa β (NF-k β) and also prevents bone resorption by blocking lipopolysaccharide induced NFk β activation.

Amaliya et al¹⁷ in 2018 for assessed the effect of guava and Vitamin C supplementation on experimental gingivitis found that the development of experimental gingivitis can be prevented by the consumption of either 200 g guava/day or 200 mg synthetic vitamin C/day.

Mango (Magnifera indica)

Mango leaf contains ascorbic and phenolic acids which are known to possess antibacterial properties. Mango leaves (magnifera indica) possess antibacterial properties against anaerobic dental microflora such as Prevotella intermedia and Porphyromonas gingivalis and can effectively be used as adjunct for maintenance of oral hygiene.¹⁸

Cloves (Sysygium aromatium)

Cloves have antiseptic, stimulant, and antiemetic (vomiting preventive), antibacterial properties and are used to treat variety of oral conditions like gum pian, adjunct to root canal therapy etc. Eugenol, the primary component of clove's volatile oils, functions as an antiinflammatory substance. Clove also contains a variety of flavonoids, including kaempferol and rhamnetin, which also contribute to clove's anti-inflammatory (and antioxidant) properties.

Garlic (Allium sativum)

Allicin is considered the most therapeutic constituent of garlic.

Groppo et al¹⁹ in 2007 found that the garlic has antimicrobial properties in vitro against streptococci and anticariogenic properties against oral microorganism.

Drynaria

One of the traditional Korean medicines, Drynaria fortunei is one of candidates known to be effective for the treatment of inflammation,



osteoporosis and bone resorption.18

Jeong et al²⁰ 2003 reported that Drynaria fortunei extracts are shown to be potent inhibitors of the degradation of denaturated collagen by cathepsin K and of bone resorption in an in vitro model.

Green tea (Camellia sinensis)

[Spurges] Jatropha curcas

[Spurges] Ricinus communis

[Walnut family] Juglens regi

gossypifolia

[spurge family, Euphorbiaceae] Jatropha

Can be used as a mouthwash or gargle in the treatment of halitosis, sore throat, plaque build-up, and dental caries. Green tea mouthwash has been shown to reduce plaque accumulation, and is free from side effects as of chemical mouthwashes like chlorhexidine, listerine.

Catechins, a main component of green tea showed an in vitro-bactericidal activity against odor-

Family and taxon Part used **Periodontal use** Rhizome Paste of rhizome is applied on gums to relieve pain [Acoraceae] Acorus calamus [Amaranthaceae] Achyranthes aspera Bark Treatment of gum disorders [Acanthaceae] Justicia adhatoda Twigs Twigs are used as toothpicks and to treat pyorrhea [Amaryllidaceae] Allium sativum Bulb Paste of the bulb is applied to the gums to treat infection [Anacardiaceae] Anacardium occientale Twigs and leaves Used for routine cleaning of teeth [Cashews] Mangifera indica Twigs, leaves Used for regular cleaning of teeth [Ginger family Curcuma longa Rhizome To treat pyorrhea and gum infections Tender leaves, Decoction of tender leaves is used as a mouthwash and to treat [Leguminosae] Acacia Arabica bark spongy gums. Burnt bark used as tooth powder. Acacia catechu [Legumes] Seeds Reduces bacterial load [Legumes] Glycyrrhiza glabra Root Effectively reduces plaque formation by its antibacterial effect. Pongamia pinnata [Legumes] Leaves Used for routine cleaning of teeth [Mahogany] Azadirachta indica Bark To treat pyorrhea and gum infections [Mints] Vitex negundo Leaves Leaf decoction is used as a mouthwash [Mulberry family] Ficus bengalensis To strengthen gums, slender twigs are used as a toothbrush. Latex, twigs [Myrtle family] Psidium guajava Leaves Used to treat swollen gums and oral ulcers [Palms] Areca catechu Used for regular cleaning of teeth. Pericarp [Palms] Cocos nucifera Husk For regular cleaning of teeth [Phyllanthaceae] Emblic myrobalan Fruit General rebuilder of oral health Used in the treatment of malodor [Piperaceae] Piper betle Leaves [Piperaceae] Piper nigrum Fruit Treatment of oral infection [Punicaceae] Punica granatum Fruit Used to treat bleeding gums Stabilizes collagen and strengthens the gingival tissues [Rose family] Crateagus oxycanthus Fruit [Rutaceae] Citrus limonum Risso Outer peel For routine cleaning of teeth [Rutaceae] Citrus medica Fruit Used to treat bleeding gums [Sapindaceae] Sapindus mucorosai Seed Used in the treatment of gingival inflammation [Salvadoraceae] Salvadora persica Stem Used as a chewing stick for oral care [Sapotaceae] Mimusops elengi Stem To treat spongy gums and pyorrhea

Stem, leaves

Root, Leaves

Oils, fruit

Twigs

Table 1 - Commonly used medicinal plants for gingival and periodontal diseases¹

Decoction of leaves used as a mouthwash and to cure bleed- ing

Roots are used as a toothbrush. Leaf juice is used as a mouth wash

gums. The stem can be used as toothbrush

Twigs can be used as toothbrush for routine cleaning

Used to make tooth powder and to treat pyorrhea



producing, periodontal bacteria, Porphyromonas gingivalis, and Prevotella species.²¹ Catechins and its derivatives could reduce periodontal breakdown by inhibiting collagenase and cysteine proteinase activity of Porphyromonas gingivalis.

CONCLUSION

Active phytochemicals are useful for the prevention, treatment and maintenance of periodontal diseases. The herbal medicines have shown to possess a wide array of biological properties such as antimicrobial, antioxidant, and anti-inflammatory effects. Herbal extracts in the form of dentifrice, medicated gel, ointment, solution etc. have been proved effective in preventing and treating periodontal disease. Pharmacologically active phytochemicals such as tannins, terpenoids, flavanoids, alkaloids are useful for the prevention, treatment and maintenance of periodontal diseases. The natural phytochemicals present in these herbs aid in suppressing the alveolar bone loss, which is the striking feature in periodontitis.

Although many studies, have shown the potency of herbal medicines as an alternative to conventional therapy, there still lies a void in research with respect to the clinical application of these agents in periodontics. Standardization and quality assurance of these herbal remedies is also a key area to be focused in future. More organized and long-term research is to be carried out to support the use of established remedies. Future targeted trials in learning the mechanism of action of these herbal remedies are warranted.

REFERENCES

- Pasupuleti MK, Nagate RR, Alqahtani SM, Penmetsa GS, Gottumukkala SNVS, Ramesh KSV. Role of medicinal herbs in periodontal therapy: A systematic review. J Int Soc Prevent Communit Dent 2023;13:9-16.
- Singh N, Savita S, Rithesh K, Shivanand S. Phytotherapy: A novel approach for treating periodontal disease. J Pharm Biomed Sci. 2016 Apr 4;6(4):1.
- Pramod K, Shahid AH, Javed A. Herbal remedies for the treatment of periodontal disease - a patent review. Recent Patents on Drug Delivery & Formulation. 2009;3(1):221–228.
- Bachrach G, Jamil A, Naor R, Tal G, Ludmer Z, Steinberg D. Garlic allicin as a potential agent for controlling oral pathogens. J Med Food. 2011 Nov;14(11):1338-43.
- Suhag A, Dixit J, Dhan P. Role of curcumin as a subgingival irrigant: a pilot study. Periodontal Practice Today. 2007 Apr 1;4(2).
- 6. Behal R, Mali AM, Gilda SS, Paradkar AR. Evaluation of local drug-

delivery system containing 2% whole turmeric gel used as an adjunct to scaling and root planing in chronic periodontitis: A clinical and microbiological study. J Indian Soc Periodontol. 2011 Jan;15(1):35-8.

- Raju Anarthe D, Mani A, Kale P, Maniyar S, Anuraga S. Herbal approaches in periodontics. Galore Int J Health Sci. 2017;2:18-25.
- Wolinsky LE, Mania S, Nachnani S, Ling S. The inhibiting effect of aqueous Azadirachta indica (Neem) extract upon bacterial properties influencing in vitro plaque formation. Journal of dental research. 1996 Feb;75(2):816-22.
- Kala BS, Gunjan C, Disha N, Shobha P. Treatment of periodontal disease-a herbal approach. Int J Pharm Sci Rev Res. 2015;33(2):126-36.
- Natarajan PM, Mathew A, Abuhijleh E, Jaber AA, Ansari AA, Bhuvaneshwari B, Babu NA. Role of Herbal Medicine in Periodontics- A Review. SRP. 2021;12(1): 1611-13.
- Somu CA, Ravindra S, Ajith S, Ahamed MG. Efficacy of a herbal extract gel in the treatment of gingivitis: A clinical study. J Ayurveda Integr Med. 2012 Apr;3(2):85-90.
- Oliveira SM, Torres TC, Pereira SL, Mota OM, Carlos MX. Effect of a dentifrice containing Aloe vera on plaque and gingivitis control: A double-blind clinical study in humans. Journal of applied oral science. 2008; 16:293-6.
- Rani N, Singla RK, Narwal S, Tanushree, Kumar N, Rahman MM. Medicinal Plants Used as an Alternative to Treat Gingivitis and Periodontitis. Evid Based Complement Alternat Med. 2022 Sep 6; 2022:1-14.
- Rayyan M, Terkawi T, Abdo H, Abdel Azim D, Khalaf A, AlKhouli Z. Efficacy of grape seed extract gel in the treatment of chronic periodontitis: A randomized clinical study. J Investig Clin Dent 2018;9:e12318.
- Toker H, Balci Yuce H, Lektemur Alpan A, Gevrek F, Elmastas M. Morphometric and histopathological evaluation of the effect of grape seed proanthocyanidin on alveolar bone loss in experimental diabetes and periodontitis. J Periodontal Res 2018;53:47886.
- Tadikonda A, Pentapati KC, Urala AS, Acharya S. Anti-plaque and anti-gingivitis effect of Papain, Bromelain, Miswak and Neem containing dentifrice: A randomized controlled trial. J Clin Exp Dent. 2017 May 1;9(5):e649-e653.
- 17. Amaliya A, Risdiana AS, Van der Velden U. Effect of guava and vitamin C supplementation on experimental gingivitis: A randomized clinical trial. J Clin Periodontol 2018;45:959-67.
- Bairy I, Reeja S, Siddharth, Rao PS, Bhat M, Shivananda PG. Evaluation of antibacterial activity of Mangifera indica on anaerobic dental microflora based on in vivo studies. Indian J Pathol Microbiol. 2002 Jul;45(3):307-10.
- Groppo FC, Ramacciato JC, Motta RH, Ferraresi PM, Sartoratto A. Antimicrobial activity of garlic against oral streptococci. International journal of dental hygiene. 2007 May;5(2):109-15.
- Jeong JC, Kang SK, Youn CH, Jeong CW, Kim HM, Lee YC, Chang YC, Kim CH. Inhibition of Drynariae Rhizoma extracts on bone resorption mediated by processing of cathepsin K in cultured mouse osteoclasts. International immunopharmacology. 2003 Nov 1;3(12):1685-97.
- Taylor PW, MT Jeremy, Miller Hamilton, D Paul. Stapleton. Antimicrobial properties of green tea catechins. Food Sci Technol Bull 2005;2:71–81.



Biting Back: Zika's Impact on Oral Health

Anil Melath¹, Subair K², Arjun MR³, Nanditha Chandran⁴, Swathi S⁵

ABSTRACT

The Zika virus (ZIKV) is a recently emerged human pathogen. It is an arthropod borne disease. Although ZIKV appears as a mild disease, it shows different symptoms. This article reviews the pathophysiology, modes of transmission, clinical features, oral manifestation, management and prevention of ZIKV infection. It spreads through the bite of infected Aedes mosquitoes. Zika virus infection has attracted the attention of international medical community, chiefly because of their role in causing microcephaly and other neurodevelopmental abnormalities in foetus / neonate which occur as a consequence of maternal infections. Education on mosquito avoidance measures and vector control efforts currently remain key to reducing risk of transmission, whilst further research is underway to develop antiviral therapies and vaccines.

Keywords: Zika virus, Mosquitoes, Flavivirus

Introduction

The Zika virus (ZIKV) is a member of the Flaviviridae family and genus of flaviviruses, which are viruses that are transmitted by arthropods.1 The virus has the name of the forest where it was originally discovered, which translates from Ugandan language to mean "overgrowth." Numerous serious human diseases, such as Dengue, West Nile fever, Yellow fever, and Zika fever, are caused by flaviviruses.² The world medical community has been more aware of ZIKV infections in recent years, primarily because of their association with microcephaly and other neurological problems that follow maternal infections.3 Serological studies performed on human serum samples in Uganda later showed the presence of neutralizing antibody against the virus, provides the first evidence that the virus can infect humans.⁴ Prior to 2007, ZIKV infections were primarily thought to have a narrow geographic distribution; nevertheless, subsequent infection outbreaks have been reported in many nations.² In this review we have discussed about the pathogenesis, clinical features especially oral manifestations, management, and prevention of ZIKV through a thorough literature search. This review will give you a broad insight about the ZIKV and its complications.

Virus Structure

A virus is an infectious microorganism made up of a protein coat and a piece of nucleic acid. Its molecular architectures are intricate. A virion is an infectious virus that has been fully formed.⁵ The most basic virions are made up of two basic parts: a protein coat and nucleic acid, which can be either singledouble-stranded RNA (Ribonucleic acid) or DNA (Deoxyribonucleic acid). named the capsid,⁵ which is composed of many protein types and functions as a shell to shield the viral genome from nucleases. It also connects the virion to particular exposed receptors on the potential host cell during infection. Together, the nucleic and capsid make up the virion's nucleocapsid. (Figure 1)

¹Professor and Head, ²Professor, ^{3,4}Reader, ⁵Post graduate student, Department of Periodontics, Mahe Institute of Dental Sciences and Hospital, Mahe, Puducherry, India. Corresponding Author: Dr Anil Melath E-mail: swathichirayil98@gmail.com



Pathophysiology

The disease mostly spreads via the bite of Aedes mosquitoes carrying the infection, especially Aedes albopictus and Aedes aegypti.⁶ When a blood-feeding female Aedes mosquito injects the virus into the skin of its mammalian host, receptive cells are subsequently infected through certain receptors, initiating vectormediated transmission of Zika.⁷ The ZIKV can infect a variety of cell types after being transmitted by a mosquito bite, including skin keratinocytes, dermal fibroblasts, and dendritic cells (DCs). High infection rates in these cells 24 to 48 hours after infection have been observed in vitro experiments on fibroblasts exposed to the ZIKV. Flow cytometric analyses of DCs exposed to the virus reveal that up to 60% of those DCs exhibit viral antigens 24 hours post-infection.²

Mode of Transmission

In urban and suburban settings, the natural transmission cycle is human-mosquito-human,involving Aedes species mosquitoes. The bulk of epidemics are caused by Aedes aegypti and Aedes albopictus.⁶ Additional modes of transmission include blood transfusions, perinatal transmission, and sexual routes. (Figure 2)

Clinical and Laboratory Features

Most cases of Zika infection are thought to be asymptomatic or very minimally symptomatic. Two to seven days are the range for the incubation period. The most typical signs and symptoms include conjunctivitis, rash, myalgia, arthralgia, headache, oedema, and selflimiting high fever. On occasion, some patients has been reported to experience symptoms such as sore throat, cough, vomiting, diarrhoea, and aphthous like mouth ulcers. Most infections seemed to be minor.⁸



Figure 1: Structure of Zika Virus

Zika Virus and Oral Health

Recently, there has been an increased focus on the oral presentation of ZIKV infection, as possible consequences for oral health have been noted by academicians and physicians. Symptoms of the Zika virus infection can vary. The oral manifestation of ZIKV infection has garnered more attention in the last few months. Scholars and doctors have recognised the potential ramifications for dental health. Many symptoms and manifestations, including pain and discomfort, malfunctioning salivary glands, mouth ulcers, abnormalities of the gingiva, and maculopapular rashes, can be caused by an infection with the Zika virus.9 Children with Congenital Zika Syndrome (CZS) often experience feeding disorders, swallowing difficulties, and a higher prevalence of low weight.¹⁰ The shape of the palate has been significantly associated with dysphagia in CZS patients. Additionally, vesicle/aphthous ulceration, palatal petechiae, altered dental growth, eruption cysts/hematomas, gingival bleeding, narrow palate, and bruxism might result from ZIKV infection.¹¹

Brazil et al. recently observed localised hyperaemia and petechiae on the hand and palate of an infected patient.¹² Additionally, Zika damages enamel, especially in anterior teeth, resulting in opacity and hypoplasia. When the primary teeth erupted, all children with congenital Zika syndrome experienced increased salivation, irritability, and gingival itching¹¹ and they exhibited a higher propensity to have short labial and lingual frenums, improper lingual posture, small palatine vaults, and delayed eruption of their first deciduous tooth. Another significant discovery is the existence of dental modifications in the quantity and shape of teeth as well as changes in the eruption sequence.¹³

In a child's normal development, the palate is relatively wide and flat during childhood, and the relationship between palatal dimensions and other body dimensions is not very strong. In more severe cases, there is a higher frequency of the tongue's improper position at rest and dental eruption delays. It is also important to draw attention to the narrow palatine vaults and changes like ankyloglossia and macroglossia. In addition, the phenotypic development of orofacial disproportions, decreased skull size, retrognathia, and



micrognathia has been favourably associated with ZIKV-caused microcephaly. Frequent hypersalivation, irritability, and gingival pruritus have also been described.¹⁴

The discovery of the ZIKV in saliva has raised concerns regarding potential glandular involvement. Some people infected with the ZIKV may have oral pain and discomfort; this can occur as a symptom in addition to the disease's systemic manifestation.⁶

Zika virus in saliva

During the acute stage of the illness, ZIKV RNA was discovered in saliva. It's unclear if saliva may carry the infection.¹⁵ It leads to malfunction of the salivary glands and raises questions regarding possible involvement of the salivary glands.⁶ It was discovered that saliva has a higher capacity for virus detection than blood or urine.¹¹

Oral ulcers are painful open sores in the mouth that some ZIKV infected people have reported. These ulcers may worsen the person's mouth pain and make it more difficult for them to eat and speak comfortably. Although it is not exclusive to the oral cavity, the maculopapular rash—a recognisable skin rash linked to ZIKV infection—may also spread to the oral mucosa and cause lesions or discolouration there.⁶

Prevention

Standard measures were created by the centre for disease control and prevention (CDC) in 1996

to stop pathogens from spreading through blood and other potentially infected materials. While saliva is another possible route of infection, blood-borne viruses have received the majority of attention in efforts to minimise transmission in dental offices8. The primary method of reducing transmission risk in dental office combine standard precautions with performance-based standards. Hand hygiene, use of personal protective equipment, reducing the risk of cross contamination are CDC's recommendations.9 The second tier of infection control- transmission based precautions may be necessary when patients have documented infection, where they may have been exposed to a highly transferable pathogen.⁵ There is no proof that the ZIKV spreads from patients to healthcare professionals, despite the virus being found in a variety of bodily fluids such as saliva and blood.

Management

There is no specific treatment option available for ZIKV infection. The course of disease is selflimiting and it can be controlled primarily by bed rest and supportive care including more intake of fluid to prevent dehydration.¹⁶ In ZIKV endemic areas systematic mosquito control programs can be carried out by public health organizations. Mosquito bite can be avoided by using mosquito repellent, window screens and bed nets. There are many studies are being carried out in zika vaccine development.



Figure 2: Transmission cycle of Zika virus



Conclusion

The Zika virus, once a relatively obscure pathogen, garnered global attention due to its swift spread and potential severe consequences, particularly for pregnant individuals and their offspring. The comprehensive review has highlighted crucial aspects of the virus, encompassing its transmission, clinical manifestations, impact on public health and ongoing efforts in research and prevention. The lesson learned from Zika outbreak underscore the importance of proactive surveillance, effective public health responses, and community engagement in combating emerging infectious disease.

In conclusion, the fight against ZIKV has illuminated the intricate intersection between health, environment, and socio-economic factors. Continued vigilance, research and global cooperation are indispensable in ongoing efforts to mitigate the impact of Zika and other emerging infectious diseases on global scale.

References

- Musso D, Gubler DJ. Zika Virus. Clin Microbiol Rev. 2016 Jul;29(3):487-524.
- Noorbakhsh F, Abdolmohammadi K, Fatahi Y, Dalili H, Rasoolinejad M, Rezaei F, Salehi-Vaziri M, Shafiei-Jandaghi NZ, Gooshki ES, Zaim M, Nicknam MH. Zika Virus Infection, Basic and Clinical Aspects: A Review Article. Iran J Public Health. 2019 Jan;48(1):20-31.
- Song BH, Yun SI, Woolley M, Lee YM. Zika virus: History, epidemiology, transmission, and clinical presentation. J Neuroimmunol. 2017 Jul 15; 308:50-64.
- DICK GW. Zika virus. II. Pathogenicity and physical properties. Trans R Soc Trop Med Hyg. 1952 Sep;46(5):521-34.
- Gelderblom HR. Structure and Classification of Viruses. In: Baron S, editor. Medical Microbiology. 4th edition. Galveston (TX): University of Texas Medical Branch at Galveston; 1996.

- Dr. Prasad Chandrakant Ingale, Dr. Arjun Machingal Ravindran, Dr. Subhajit Bohidar, Dr. Pratik Surana, Dr. Venkata Saiteja Mungara, Dr. G Nadeswari. Role of oral health professionals in Zika virus infection, prevention and management: A literature review. Int J Mosq Res 2023; 10(6):170-172.
- Hamel R, Dejarnac O, Wichit S, Ekchariyawat P, Neyret A, Luplertlop N, Perera-Lecoin M, Surasombatpattana P, Talignani L, Thomas F, Cao-Lormeau VM, Choumet V, Briant L, Desprès P, Amara A, Yssel H, Missé D. Biology of Zika Virus Infection in Human Skin Cells. J Virol. 2015 Sep;89(17):8880-96.
- Snehal Dilip Kothavale, Rinaj Rasul Attar, Dr. S. K. Mohite, Sagar B. Patil. Zika Virus: A Comprehensive Review. Research Journal of Pharmacology and Pharmacodynamics 2023;15(1):24-0.
- Dobson JS, Levell NJ. Spotting Zika spots: descriptive features of the rash used in 66 published cases. Clin Exp Dermatol. 2019 Jan;44(1):4-12.
- Medina DT, Santos APPD, Rodrigues FMDF, Oliveira BH. Oral manifestations of congenital Zika virus infection in children with microcephaly: 18-month follow-up case series. Spec Care Dentist. 2022 Jul;42(4):343-351.
- Cavalcanti AFC, Aguiar YPC, de Oliveira Melo AS, de Freitas Leal JIB, Cavalcanti AL, Cavalcanti SDLB. Teething symptoms in children with congenital Zika syndrome: A 2-year follow-up. Int J Paediatr Dent. 2019 Jan;29(1):74-78.
- Hasan S, Saeed S, Panigrahi R, Choudhary P. Zika Virus: A Global Public Health Menace: A Comprehensive Update. J Int Soc Prev Community Dent. 2019;9(4):316-327.
- Carvalho IF, Alencar PNB, Carvalho de Andrade MD, et al. Clinical and x-ray oral evaluation in patients with congenital Zika Virus. J Appl Oral Sci. 2019;27:e20180276.
- da Silva Sobrinho AR, Ramos LFS, Maciel YL, Maurício HA, Cartaxo RO, Ferreira SJ, Sette-de-Souza PH. Orofacial features in children with microcephaly associated with Zika virus: A scoping review. Oral Dis. 2022 May;28(4):1022-1028.
- 15. Matthews Anna, Brown Gwen. Zika virus in dental setting from decision in Dentistry. July 2016; 2 (07): 40-43.
- Sharma V, Sharma M, Dhull D, Sharma Y, Kaushik S, Kaushik S. Zika virus: an emerging challenge to public health worldwide. Can J Microbiol. 2020 Feb;66(2):87-98.



Exploring Simulation's Role in Dental Education: A Comprehensive Overview

Aiswarya Lekshmy S¹, T.K Krishna Priya², Bindu R Nayar³

ABSTRACT

Simulation is a cornerstone of medical education, presenting both advantages and challenges. It provides students with opportunities to learn fundamental and advanced skills while minimizing risks and ensuring epidemiological safety. Although it cannot entirely replace real clinical experience, simulation greatly enhances practical teaching methods and student learning outcomes. Particularly during the corona virus disease (COVID-19) pandemic, the use of dental simulation has surged, offering a safe environment for training manual skills and specific curriculum scenarios. Virtual reality-based education has proven effective in enhancing students' practical skills, theoretical knowledge, and self-confidence.

Keywords: Haptic Devices, Virtual Reality, Robotics, Advanced Software in Dental Education Simulation

Introduction

Simulation has a historical backdrop within the realm of medical practice, evolving from rudimentary models designed to facilitate skill and technique development. Simulation is an essential educational technique utilized to improve confidence, competence, patient safety, and error reduction in clinical settings, complementing traditional teaching purpose.

Simulation is a technique, not a technology–to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner.¹ Use of simulation is widespread in all forms of clinical education with key aims of improving confidence and competence, patient safety and reducing errors. It is one tool in the educational repertoire similar to skill labs, lectures, case discussions etc. This idea has led to expansion of facilities, equipments and investments in the area of simulation. For example, The Royal College, United Kingdom are including mandatory training using simulation in their curricula. The National Medical Commission curriculum has now made skills training mandatory for undergraduate medical students in simulation laboratories that are to be set up by every teaching institution.² Protecting patients from harm should always be a top priority, as they are not commodities but individuals deserving respect and care. Recognizing that human error is inevitable, healthcare professionals must adhere to the ethical principle of "do no harm" above all else.

Simulation technology, like virtual reality simulators such as PerioSim, has become crucial in dental education, particularly in Periodontics. It provides a safe and realistic environment for students to practice procedures, receive feedback, and develop crucial skills like hand-eye coordination and decision-making. Moreover, it benefits experienced practitioners by offering opportunities for skill refinement without patient risk. As technology advances, simulation tools become more sophisticated, replicating tactile sensations and visual cues of actual procedures, enhancing both technical proficiency and understanding of anatomical

^{1,2} House surgeon, Government Dental College, Alappuzha, Kerala, India ³Professor and Head, Department of Periodontics, Government Dental College, Alappuzha, Kerala, India. Corresponding Author: Dr. T.K Krishna Priya. E-mail: tkkp97@gmail.com

structures and conditions. In the future, simulation is expected to play an even larger role in periodontics education and practice, improving training effective-ness and patient outcomes.³

History

Simulation has a long history in medical practice, starting from basic models to enable learners to practice skills and techniques. History of use of simulators dates back to 19th century, when manikins called phantoms were used for describing process of childbirth, to teach midwives in 1600s. Madame du Coudray, mid wife to the court of King Louis XV developed 'the Machine', a life-sized and anatomically correct model made of cloth, leather and sponge with which she travelled countryside teaching to aid childbirth.⁴

The first commercial based manikin to be developed was Mrs. Chase in 1911 which was used to train nurses, to dress, turn them over and transfer them from bed to bed. This manikin was created by Martha Jenks Chase, of Pawtucket, R.I., who went into business making dolls as children's toys in 1901. Her dolls were popular because they were lightweight and sturdy but still had some of the realistic features of porcelain dolls sold in stores. At the request of A. Lauder Sutherland, principal of the Hartford Hospital Training School, Chase made an adult-sized manikin for nurse training in 1913.

Domains of Clinical Competence

The Accreditation Council for Graduate Medical Education (ACGME) in the United States describes six domains of clinical competence: 1) Patient care 2) Medical knowledge, 3) Practice-based learning and improvement, 4) Interpersonal and communication skills, 5) Professionalism, and 6) Systems- based practice.⁵ Evaluators may use simulations to assess various knowledge, skills, and attitudes within these domains.⁶

Miller's Pyramid

In 1990, George Miller developed a theoretical tool for assessment of clinical competence. According to him, traditional assessment of medical students relied too much on testing knowledge and not on assessing how they would behave in a real-life consultation.⁷ As we go from lower to higher level in Millers Pyramid, the clinical competence of learner is increased. In Millers pyramid (Figure 1), simulation tests come under the third tier which is more reliable than the lower levels which include written exams and clinical problem-solving exercises.



Figure 2a: Resusci Anne



Figure 2b: Harvey



Figure 1: Miller's pyramid for assessment of clinical competence

28 Vol. 16 | Issue 1 | March 2024



Cycles of simulation scenario

Simulation based learning is a cyclic process which includes the following steps:⁸

- 1. Preparation phase: simulation setting is prepared.
- 2. Pre-briefing: conducted prior to simulation exercise where preparatory information are given.
- 3. Simulation exercise is conducted.
- 4. Debriefing: learners and instructors sit together and reexamine the simulation experience and discuss various aspects of completed simulation.
- 5. Evaluation phase

Fidelity

Fidelity pertains to the extend to which various aspects of a situation, action, belief, environment, or object mimic real-life scenarios. It encompasses considerations across equipment, tasks, environments, and psychological factors.⁹ Simulation-based learning builds upon Kolb's experiential learning cycle, initiating with concrete experiences, followed by reflective observation, abstract conceptualization, and ultimately, active experimentation by the learner.¹⁰

SIMULATION MODALITIES

PART TASK TRAINER

These are low fidelity manikins that are designed for education of only a particular task.

Resusci Anne Simulator

A. Laerdal developed a realistic teaching aid for mouth-to-mouth resuscitation.¹¹ It was made as lifelike as possible using the face of a beautiful girl found floating in River Seine, presumably after a failed romance. A death mask was taken and widely reproduced and is now famous. (Figure 2a)

Harvey

Dr. Michael Gordon demonstrated Harvey cardiovascular part task trainer designed to assist in teaching cardiovascular examination and diagnostic skills.¹² This was named after Gordon's mentor, W. Proctor Harvey a Physician of Georgetown University. It consists of a manikin (minus legs) recumbent on a large cabinet containing the electronic and electromechanical workings. It simulated jugular & radial pulse, precordial impulses and heart sounds in four auscultatory areas and to vary those sounds with respiration in fifty different cardiac conditions.¹³ Harvey is still used as a pivotal technology in focused cardiorespiratory learning for under graduate students of medicine in hundreds of schools worldwide and has found to improve the skills of students.¹⁴ (Figure 2b)

SIMULATED PATIENTS

In 1964, Barrows and Abrahamson¹⁵ recognized that the ability to interact with real patients was of importance when assessing the abilities of medical students. These were programmed patients or normal person trained to assume and present the history and, on examination, neurological findings of a patient in the manner of an actual patient.¹³

A young female professional art model with acting ability was given an 'in doctrination program' which aimed to make her fully aware of the entire neurological examination procedure and the basic terminologies used, along with findings of specific cases. Some found the use of actors demeaning to medical education. Kretzschmar¹⁶ recruited a group of professional patients or Gynecology Teaching Associates (GTAS). GTAS (Figure 3) were trained in common clinical conditions associated 'personality problems'



Figure 3: Gynecology Teaching Associates



Figure 4: Moulage



Figure 5: Standardized patient

'

in recognition that patients and disease states are not synonymous and that doctors should be trained to deal with the complexities of normal clinical life and in giving feedback. Similarly, there were Genito Urinary Teaching Associates (GUTAs) who were males recruited for genitourinary examination.¹⁴

MOULAGE

It is a feature that can be added to simulated patients and mannequins to improve realism (Figure 4). Here, makeup and molds are applied to the humans or mannequins to portray lesions, skin findings, bleeding or traumatised areas.¹⁷

STANDARDIZED PATIENTS (SP)

SPs were first introduced in 1960s. They are simulated patients trained to portray a patient in a realistic, standardized and repeatable consistent manner where portrayal varies based only on learner's performance and not according to need of a patient.¹³ (Figure 5) Similar to simulated patients, standardized patients can also be used to present case history in response to questioning by the student, undergo a limited physical examination at the student's direction, assist students in developing their communication and clinical skills, assist students in working through difficult emotional situations in a safe environment.

HYBRID SIMULATION

In this type of simulation modality, the simulated patients are incorporated with part task trainer.¹⁸ Here the technology is merged with simulated patients to simulate a particular scenario which the human actor is notable to simulate or would be at risk to simulate.¹³ Colleges with low budget can adopt this technology as high-fidelity manikins need more sophisticated technology.

SCREEN BASED SIMULATION

This modality was introduced by Barrow and Abrahamson in 1960s.¹⁹ The advent of digital media and more sophisticated interface has allowed the development of wide range of on screen simulation. A vast array of e-learning resources are available, some of which contains interactive and exploratory elements which allow students to work through clinical cases in a manner that mirrors clinical practice.¹³

Examples:

- i. Body Sim Programme²⁰: This divided human body into a series of small discrete models each with a series of interactions with multiple other models. Administration of anaesthetic gas resulted in transfer of gas to blood and then the heart which would then reduce carbon monoxide and so reduce the uptake of gas and so on. Thus, the effect of administration of treatments could be demonstrated in real time.
- ii. Gas man²¹: This contains a series of educational exercises with the aim of increasing students' delivery of anaesthesia safely.
- iii. Advanced Cardiovascular Life Support (ACLS) simulator²²: It is used to learn and retain basic resuscitation skills.

AVATARS

Avatars are three dimensional (3D) graphical representation of a person capable of more complex actions like physical responses and facial expressions (Figure 6a & b). These can be controlled using a mouse, joystick or keyboard. It is designed so that students can practice interviewing, asking the right questions and developing effective communications skills.¹⁷



Figure 6a: Use of avatar (virtual patients) in Personalised Care Institute



Figure 6b: Use of avatar in virtual simulation environment for interaction training in pediatric emergency



SIMULATED ENVIRONMENT

It was introduced by Gaba and DeAnda in 1987.²³ Simulated environment is a complex manikin combined with an entire operating room environment. Physical setting where simulation activities may take place, inclusive of people equipment that form part of simulation experience.¹³ Examples include comprehensive anesthesia simulation environment and Gainesville anesthesia simulator.

VIRTUAL REALITY

It is a computer-generated 3D environment that gives immersion effect to the user. It was introduced in 1989 by Rosen and Delp.

Examples include:

- i. Kinematick Simulation, Monitoring and Offline Programming Environment for Telerobotics (KISMET)¹³– It is a laparoscopic instrument incorporated with motion sensors, so that movement of instruments can be detected which is then transferred to the computer and then to the model.
- ii. CAVE Automatic virtual environment¹³ (Figure 7) – These are large scale virtual environment consisting of rear projections, 3D screens and high-definition sound which provides an immersion environment. For example, the problem of dealing with casualties at the side of road next to moving cars can be simulated.
- iii. Second Life: This is an interactive webbased software developed in 2007, where individuals can access a virtual online world as computer generated avatars or virtual self with physical characteristics as chosen by the user.

HAPTIC FEEDBACK

It is the ability of the simulator to apply pressure to the hands of the operator so as to mimic the tactile sensation of instrument and tissue manipulation (Figure 8). Anatomical variations, bleeding and the use of a variety of techniques can be simulated.

DENTAL SIMULATORS

Simulation technology, including virtual reality, is increasingly being used in dental education to enhance the acquisition of psychomotor skills and provide more effective, efficient, and cost-effective training. While virtual reality simulators have been found to improve fine motor skills and hand-eye coordination in preclinical settings, they still have some limitations, such as initial set up costs and the need for faculty training. However, the future of dental simulators looks promising, with the potential for individualized learning assistance and diverse functions.

CONVENTIONAL DENTAL SIMULATORS

During the 1800s, a significant challenge in dental education was the scarcity of natural human teeth available for practice due to the high demand for dentures. Initially, denture teeth were crafted from ivory, with a notable source being the teeth of war victims from the Battle of Waterloo, leading to the term "Waterloo denture".²⁴ In the late 20th century, there was a shift towards the use of resin-based teeth. In 1894, Sir Oswald Fergus introduced the first phantom head, marking milestone in dental education.²⁴ Subsequent years witnessed the evolution of phantom heads (Figure 9) in various forms, including models with removable teeth and the incorporation of hand pieces, enhancing the fidelity and effectiveness of dental simulation.



Figure 9 : Phantom head

Figure 7: CAVE automatic virtual environment



VIRTUAL REALITY DENTAL SIMULATORS

Periosim

Periosim (Figure 10) was developed by University of Illinois in 2008. It uses 3D virtual reality and haptic technology. In this, a 3D human mouth is shown in real-time on a computer screen while manipulating actual dental tools in their hands. Teaching staffs can create patient scenarios of periodontal procedures. Features of periosim include:

- Force measurement
- Feedback and limitation
- Adjust the viewpoint and the model transparency
- Training capabilities
- Recording/replaying the instructor actions and evaluating student performance
- Realistic sound production
- Supporting different Haptic devices

Voxel- Man Dental

It gives the look and feel close to a real procedure. It improves manual dexterity and problemsolving skills of students. Teeth and instruments are modeled inside a computer and visualized on a 3D screen. Handpiece is represented by a haptic device. The subtle differences between enamel, dentin, pulp, or carious tissue can be felt. Features of Voxel- Man Dental include:

- 3D display with 3D glasses
- Industry-leading image quality
- High resolution tooth models derived from real teeth by microtomography
- Drilling with realistic haptic feedback
- Additional cross-sectional images
- High and low speed burs with matching haptics and sound
- Dental mirror
- Foot pedal
- Compact unit

Dentsim

It is fully integrated with traditional lab, allowing the students to work on mannequins while viewing their work real-time on the computer monitor. It uses advanced cameras augmented with GPS-based tracking on the hand piece. It provides the students with a 3D view of their work. It also gives feedback on all aspects of the procedure. (Figure 11)

Individual Dental Education Assistant (IDEA)

Individual Dental Education Assistant (IDEA) is a virtual reality hand flexibility training simulator consisting of a handheld stylus and a computer installed with simulation software.²⁵ It enable students to be flexible and proficient in the use of dental hand pieces. Features include:

• Train dental students in hand flexibility by



Figure 10 : Periosim



practicing removing predesigned virtual materials with different shapes (eg, straight line or circle)

- Two parameters determine the score obtained: drilling speed and drilling accuracy.
- Improve students' performance in the dental skill test; in addition, it can be used to identify students allow for early intervention to prevent failure.

Simodont

It mainly includes modules for hand flexibility, cariology, crown and bridge preparations, clinical cases, and a full mouth simulation experience.25 It requires 3D glasses for 3D display. An X-ray of the working tooth is attached to each individual case. (Figure 12)

VirTeasy

It is composed of VirTeaSy Scan Implant and VirTeaSy Implant Pro. It is supplemented by an auxiliary system that can alert students if the drilling's location, angle, and depth are incorrect as well as if there is overheating of the bone.²⁵ (Figure 13)

Advantages

- Patient safety
- Immersive learning experience
- Better understanding of abstract concept
- Skill acquisition and maintenance
- Assessments of skills and competence
- Focus on student confidence
- Team training •
- Safe intro to technologies
- Planned standardized learning technique
- Hands on teaching of clinical skills



Figure 12: Simodont



Figure 13: VirTeasy

Disadvantages

- Incomplete mimicking of human system
- Time and cost
- Technical difficulties
- Learner's attitude
- Lack of trained operators

SIM to CAREdente

SIM to CARE Dente (Figure 14 a & b) is the next generation dental simulator. It uses the latest technology available to create a realistic training experience. It provides features like high fidelity haptic, 4K high resolution screen with auto stereo technology, teachers dashboard and a case editor which allows editing and customization of cases.

CONCLUSION

The escalating demands for clinical training, coupled with challenges such as faculty shortages, costs, and evolving teaching and assessment methods, necessitate universities to embrace technology-driven teaching and learning platforms to enrich student learning experiences. Emerging technologies like haptic and virtual lab environments enhance motor skills, efficiency, and diminish faculty training duration. However, additional research is imperative to fully integrate simulation-based learning into curricula. Furthermore, accreditation by the Society for Simulation in Healthcare (SSH) is obligatory for simulation centers, promising substantial advancements in medical education upon implementation.

Simulation plays a crucial role in medical education, offering various benefits and opportunities for improvement. It is considered a fundamental strategy for addressing current and future challenges in medical education, providing effective learning experiences

Figure 14 a, b: Training using SIM to CARE dente



JSPIK



based on educational theories. The use of simulation in medical education has grown significantly in the last two decades, becoming a primary tool in training healthcare professionals and aligning with new educational paradigms. Simulation allows for the development of psychomotor skills, and strengthens executive functions. Integration of simulation in medical education is supported by a solid theoretical basis and has broad applications in both undergraduate curricula and continuing medical education. The future of medical education simulation looks promising, especially with the ongoing technological advancements that enhance its effectiveness and efficiency. Simulation offers opportunities to practice clinical skills in a risk-free environment, contributing to improved learning outcomes and patient care. The evolution of simulation has a long history, with advancements in technology driving its progress and integration into curricula to enhance licensing processes, board certifications, and patient safety. Overall, simulation in medical education is a valuable tool that continues to evolve, offering a pathway for innovation, improved training, and enhanced patient care in the healthcare industry.

REFERENCES

- Gaba DM. The future vision of simulation in health care. Qual Saf Health Care. 2004 Oct;13 Suppl 1:i2-10.
- 2. Medical Council of India, Competency based Undergraduate curriculum for the Indian Medical Graduate, 2018. Vol. III.
- Roy E, Bakr MM, George R. The need for virtual reality simulators in dental education: A review. Saudi Dent J. 2017 Apr;29(2):41-47.
- Gardner R, Raemer DB. Simulation in obstetrics and gynecology. Obstet Gynecol Clin North Am. 2008;35:97-127.
- Holmboe E S, Edgar L, Hamstra S J. The Milestones Guidebook. Chicago, IL: Accreditation Council for Graduate Medical Education; 2016.
- Scalese RJ, Obeso VT, Issenberg SB. Simulation technology for skills training and competency assessment in medical education. J Gen Intern Med. 2008;23(Suppl 1):46-49.
- Miller GE. The assessment of clinical skills/competence/performance. Acad Med. 1990;65: S63–7.
- De Vin, Leo. (2Simulation, Models, and Results: Reflections on their Nature and Credibility. Proceedings of FAIM2015, Wolverhampton 2015, pp 148-155.

- 9. Rashid P, Gianduzzo TR. Urology technical and non-technical skills development: the emerging role of simulation. BJU Int. 2016 Apr;117 Suppl 4:9-16.
- 10. Kolb DA. Experiential learning: Experience as the source of learning and development. New Jersey: Prentice-Hall; 1984.
- Cooper JB, Taqueti VR. A brief history of the development of mannequin simulators for clinical education and training. Postgrad Med J. 2008;84:563-570.
- 12. Michael SG. Cardiology patient simulator: development of an animated manikin to teach cardiovascular disease. Am J Cardiol. 1974;34:350-355.
- 13. McKimm J, Forrest K, Edgar S. Essential simulation in clinical education. UK: Wiley-Blackwell;2013.
- Loftin C, Garner K, Eames J, West H. Use of Harvey[®] the Cardiopulmonary Patient Simulator in Physician Assistant Training. J Physician Assist Educ. 2016 Mar;27(1):32-39.
- Barrows HS, Abrahamson S. The programmed patient: a technique for appraising student performance in clinical neurology. Acad Med. 1964;39:802-805.
- Kretzschmar R. Evolution of the gynecology teaching associate: an education specialist. Am J Obstet Gynecol. 1978;131:367-373.
- 17. Lopreiato JO. Healthcare Simulation Dictionary. Rockville, MD: Agency for Healthcare Research and Quality; 2016.
- Kneebone R, Nestel D, Vincent C, Darzi A. Complexity, risk and simulation in learning procedural skills. Med Educ. 2007;41:808-814.
- Kneebone R, Kidd J, Nestel D, et al. An innovative model for teaching and learning clinical procedures. Med Educ. 2002;36:628-634.
- Rosen K. The history of medical simulation. J Crit Care. 2008;23:157-166.
- Philip J. Gas Man An example of goal oriented computerassisted teaching which results in learning. Int J Clin Monit Comput. 1986;3:165-173.
- Schwid HA. Components of an effective medical simulation software solution. Simul Gaming. 2001;32:240-249.
- Gaba DM, DeAnda A. A comprehensive anesthesia simulation environment: re-creating the operating room for research and training. Anesthesiology. 1988;69:387-394.
- Li Y, Ye H, Ye F, Liu Y, Lv L, Zhang P, et al. The current situation and future prospects of simulators in dental education. J Med Internet Res. 2021;23(4).
- 25. Perry S, Bridges SM, Burrow MF. A review of the use of simulation in dental education. Simul Healthc. 2015;10(1):31-37.
- 26. Kohn LT, Corrigan JM, Donaldson MS. To err is human: Building a safer health system. Washington DC: National Academy Press; 1999.
- Grypma S. Regarding Mrs. Chase. J Christ Nurs. 2012 Jul-Sep;29(3):181.



Dentine Hypersensitivity: A Contemporary Approach to a Traditional Challenge

Siyana S¹, Arun Narayanan², Shabeer Ali K.P³, Rizleena Majeed⁴

ABSTRACT

Dentinal hypersensitivity is disease that occurs as a result of dentin exposure it is a prevalent, painful condition of the teeth. In dentine hypersensitivity, lesions exhibit patent tubules at the exposed dentine surface and appropriate stimuli trigger pulpal nerves via a hydrodynamic mechanoreceptor mechanism to produce a typically short, sharp, painful response. There are several theories explaining the mechanism of hypersensitivity causing pain but hydrodynamic theory is most widely accepted nowadays. Treating dentinal hypersensitivity is a challenge for dental professionals. This article reviews the etiology, mechanism and prevention strategies of dentinal hypersensitivity and also discusses recent advancements in its management. **Keywords:** Dentinal hypersensitivity, Dentinal tubules, Hydrodynamic theory.

Introduction

In 1982, dentine hypersensitivity was described as an enigma, because it was frequently encountered yet poorly understood.¹ Dentine hypersensitivity is defined as a diminutive and sharp pain which arises from exposed dentin surface in reaction to a stimulus of thermal, evaporative, tactile, osmotic or chemical origin.² Dentin exposure could be due to either enamel loss or cemental loss. This is followed by removal of smear layer by mechanical or chemical means. One of the earliest citings of dentine hypersensitivity dates back to Blum in 1530. However, it was not until 1700 that this oral pain condition was more extensively investigated.³ Zero & Lussi stated that following the decline of tooth loss in the 20th century, the increasing longevity of the teeth with tooth wear in the 21st century will be far more demanding on the preventive and restorative skills of the dental professionals.⁴ Prevalence of periodontal disease in a population retaining their teeth for longer period lead to increased recession as a result of both disease and treatment.

Terminology and Prevalence

According to Gillam et al⁵, various terms have

been used to describe dentine hypersensitivity:

- Dentine Sensitivity
- Dentine Hypersensitivity
- Dentinal Hypersensitivity
- Cervical Hypersensitivity
- Root Hypersensitivity
- Cemental Hypersensitivity

Prevalence for dentine hypersensitivity varies from 3 to 57%.⁶ Dentine hypersensitivity can present from early to old age, with the majority of sufferers aged between 20 to 40 years.⁷ Women are more frequently affected and at a younger mean age. Later in life, age-related changes in pulpal processes result in a reduction of sensitivity owing to reparative processes, such as secondary dentine and tertiary dentine, fibrosis in the pulp and sclerosis of the tubules, which will decrease permeability and reduce the hydraulic conductance of dentine.

Aetiological and Pre-Disposing Factors Associated with Dentine Hypersensitivity⁹

Number of etiological and predisposing factors has been implicated in the initiation of dentine

¹Postgraduate Student, ²Professor and Head, ³Reader, ⁴Senior Lecturer, Department of Periodontics, Kannur Dental College, Anjarakandy, Kannur, Kerala, India. Corresponding Author: Dr Siyana S, E-mail: siyana0004@gmail.com



Siyana S¹, Arun Narayanan², Shabeer Ali K.P³, Rizleena Majeed⁴

hypersensitivity:

- Loss of enamel, denudation of cementum
- Gingival recession
- Attrition, abrasion, abfraction, erosion (intrinsic and extrinsic)
- Tooth malposition, patient habits
- Thinning, fenestration, absent buccal alveolar bone plate
- Periodontal disease and its treatment, periodontal surgery, restorative treatment

Specific Biological Processes associated with the Aetiological Factors in Dentine Hypersensitivity⁸

Lesion Localization

Starts due to dentin exposure either enamel loss or cemental loss. The various factors attributed are gingival recession, attrition, abrasion, erosion, abfraction, improper instrumentation, and lack of overlap between enamel and cementum at cemento-enamel junction (CEJ).

Lesion Initiation

This process requires the opening of dentinal tubules. Toothpaste with abrasives, erosive agents, etc. lead to removal of smear layer after few minutes of exposure and causes bulk loss of dentin. The smear layer is composed of elements of protein and sediments derived from salivary calcium Phosphate and seal the tubule inconsistently and transiently. Both mechanical and chemical exposure is required for loss of the smear layer.

Mechanism of Dentin Hypersensitivity

Several theories have been put forward to explain the mechanism of dentinal hypersensitivity causing pain. Theories related to the mechanism of dentinal hypersensitivity:

Direct innervations theory

This theory states that nerve endings penetrate the dentino-enamel junction and an action potential is triggered when these nerves are stimulated mechanically the entire length of the tubule contains free nerve endings. However microscopic studies suggested that neural cells in outer dentin are unlikely. Also, the plexus of Raschkow do not establish till the teeth erupt yet newly erupted teeth are sensitive.

Odontoblastic transduction theory

Theory states that odontoblasts extend to the periphery. Stimuli initially excite the odontoblastic process. Since the membrane of the odontoblast is in close apposition with that of nerve ending in pulp, they transmit excitation to the associated nerve endings odontoblasts are restricted only to the inner third of the tubule and no synapse was seen between odontoblast and nerve terminals (Rapp et al).¹⁰

Hydrodynamic theory

This is the most acceptable theory at present and was given by Brannstorm in 1964. The stimulus causes displacement of fluid that activates the nerve endings particularly A -delta fibers. This displacement can be outward or inward. Stimuli like cold cause outward movement of fluid and produces more rapid and greater pulp response than heat.

The trigeminal nerve supplies the pulp, with innervation from myelinated fibers and non-myelinated C fiber the larger myelinated fibers can respond to stimuli that displace the fluid in the dentinal tubule through a hydrodynamic mechanism, such as tactile, evaporative, osmotic or thermal challenges, to elicit short, sharp, stabbing pain that typically lasts for only a few seconds. The classical pain experienced with dentine hypersensitivity can persist as a dull, throbbing ache for variable periods of time. Another term, root sensitivity, has been suggested by the 2002 Workshop of the European Federation of Periodontology for dentine hypersensitivity arising from gingival recession in periodontal disease and following periodontal treatment. This group of patients may have microorganisms invading the root dentinal tubules of periodontally involved teeth, with pain often occurring interdentally, coinciding with recession in these areas. Hence, this condition may be of different etiology but results in similar pain symptom.

PERIODONTAL FACTORS

Gingival recession can be influenced by various factors such as root prominences, frenal pull, dehiscence, fenestrations in the underlying bone, orthodontic movement, and the positioning of roots outside the alveolar bone. These conditions contribute to the exposure of root surfaces, which in turn can lead to root sensitivity.¹¹ Patients with poor oral hygiene are at a higher risk of periodontal disease, which involves the destruction of supporting bone tissue and subsequent root exposure. Exposed root surfaces are vulnerable to acids produced by bacteria, which can penetrate the dentinal tubules and exacerbate hypersensitivity.¹² Consequently, hypersensitivity can negatively impact oral hygiene practices. Additionally, periodontal treatments, such as root surface debridement, can further expose root surfaces by removing cementum. This process, while essential for treating periodontal disease, can contribute to increased root sensitivity due to the loss of protective tissues.

Gingival recession leading to dentin exposure can be classified as either "healthy" or "unhealthy" based on its etiology and impact on oral health.¹³ Healthy gingival recession often results from chronic trauma, particularly from aggressive tooth brushing. In this case, the recession itself may not necessarily indicate underlying periodontal disease but rather a response to mechanical irritation. The dentin exposure observed in the cervical areas of teeth on buccal surfaces can result from either gingival recession or enamel loss. Enamel loss may occur due to factors such as erosion, abrasion, or attrition, which can lead to the uncovering of dentin. Iatrogenic induction of hypersensitivity, as reported by Irwin et al. in 1997, can occur after scaling and root planning.¹⁴ During this periodontal treatment, the removal of plaque, calculus, and the smear layer from the root surface exposes dentinal tubules. The smear layer, composed of collagen and glycosaminoglycans, forms an adherent matrix over mineralized tissue and helps occlude dentin tubules. Its removal during root surface debridement can leave dentin vulnerable to external stimuli, potentially inducing hypersensitivity. Understanding the causes and effects of dentin exposure, whether due to gingival recession, enamel loss, or iatrogenic factors, is essential for effective management and prevention of dentin hypersensitivity.

Tooth wear encompasses various processes that can be either physiological or pathological. Physiological wear, often associated with aging, involves the gradual deposition of reparative dentin by the pulp, which can help reduce hypersensitivity. Pathological wear, on the other hand, includes erosion, attrition, abrasion, and abfraction. In physiological tooth wear, the pulp responds by laying down reparative dentin within the dentin tubules, a process that can mitigate hypersensitivity by providing a protective layer. However, pathological wear such as erosion and abrasion can exacerbate hypersensitivity. Erosion involves the superficial demineralization of enamel due to chemical dissolution by acids, which may be intrinsic (e.g., regurgitated acid from vomiting or gastroesophageal reflux) or extrinsic (e.g., acidic foods or beverages). Acid exposure can weaken enamel and increase the likelihood of dentin exposure, leading to hypersensitivity. Abrasion, on the other hand, is the pathological mechanical wear of teeth typically caused by external factors like aggressive tooth brushing and abrasive toothpaste. Toothbrush abrasions can contribute significantly to dentinal wear and hypersensitivity.¹⁵ Factors such as the type of brush, brushing force, duration, and frequency can influence the extent of abrasion. Brushes with medium or hard bristles and excessive force during brushing are associated with increased dentinal wear and heightened sensitivity

JSPIK

Manual brushes indeed tend to cause more dentinal wear compared to electric brushes. Addy et al. noted that normal tooth brushing doesn't typically cause significant wear on enamel alone.16 However, toothpaste, commonly used during brushing, can contribute to abrasion. Toothpaste abrasivity is quantified using the Relative Dentin Abrasivity Index. Abrasivity should not exceed 2.5 times to prevent excessive wear on enamel, while pH levels should be above those that can cause demineralization, safeguarding against acid erosion. Attrition is considered to be physiologic process of wear of hard tissues of teeth due to toothto-tooth contact incisal, proximal, or occlusal. Dentine hypersensitivity is seen with attrition in individuals with parafunctional habits. This increased force and the time of contact could lead to excessive attrition and subsequently hypersensitivity. Abfractions are the lesions seen in the cervical regions and suspected etiology is occlusal stress. Smith and Robb in 1996 highlighted erosion and abrasion as the main etiologies of hypersensitivity.¹⁷ Additionally, Ferrari et al. noted that tooth bleaching procedures commonly result in hypersensitivity during treatment, although these symptoms are typically temporary.¹⁸ The dehydration caused by bleaching agents like carbamide peroxide, due to its breakdown into hydrogen peroxide, can lead to hypersensitivity during the bleaching process.

The periodontal disease and its treatment can lead to root sensitivity. Periodontitis patients frequently do not present with pain or sensitivity as a primary complaint however this can be one of the features along with other symptoms such as bleeding gums, spacing between the teeth and mobility. Dababneh et al reported that patients with root sensitivity are hav-



Siyana S¹, Arun Narayanan², Shabeer Ali K.P³, Rizleena Majeed⁴

ing higher incidence of periodontitis ranging between 72.5% and 98%.8 Que et al reported that periodontal patient showed a higher prevalence rate for root sensitivity and were more associated with degree of attachment loss (78.6%) than with the gingival recession (31.4%).¹⁹ Von troil et al stated that the occurrence of sensitivity on denuded root surfaces following periodontal therapy may be a condition distinct from dentinal hypersensitivity occurring after hydrodynamic stimulation and preferred to use term root sensitivity.²⁰ Rees and Addy reported that the number of sensitive teeth per patient with periodontal disease who smoked was approximately double that of a smoker with no periodontal disease and these patients also had greater amounts of gingival recession than non-smokers with hypersensitivity.²¹ Drisko et al suggested that root sensitivity following scaling and root surface debridement can be controlled by desensitizing dentifrice and chlorhexidine for 2-3 weeks the periodontal patients who presents with root sensitivity are at higher risk for root caries hence these group of patients would be benefitted by topical fluoride containing desensitizing agents either in the form of dentifrice or mouth rinse.¹¹

Diagnosis of Dentinal Hypersensitivity

Diagnosing dentinal hypersensitivity requires

careful consideration and the exclusion of other potential causes of dental pain. This is because several conditions can present with similar symptoms, such as short, sharp tooth pain. Before confirming a diagnosis of hypersensitivity, dental professionals must thoroughly evaluate the patient to rule out other possible causes of their symptoms. This process helps ensure that appropriate treatment is provided and that the patient's dental health is properly managed.

DIFFERENTIAL DIAGNOSIS

Prior to advocating treatment regimens, it is important to consider confirmation of the correct diagnosis and exclude the differential diagnosis. A number of other dental conditions can give rise to pain symptoms similar to those of dentine hypersensitivity. Indeed, a definitive diagnosis of dentine hypersensitivity is reached through exclusion of the following conditions, which need a variety of treatment options for resolution. Differential diagnosis of dentine hypersensitivity include:

- Cracked tooth syndrome, often in heavily restored teeth.
- Incorrect placement of dentine adhesives in restorative dentistry, leading to nanoleakage.
- Fractured restorations and incorrectly placed dentine pins.

| CASE HISTORY | Includes nature of pain, intensity, frequency, duration, and stimuli caus- |
|-----------------------|---|
| | ing pain. |
| EXAMINATION | Various tests like radiographic examination, percussion test, and vitality |
| | test to rule out pulpal involvement are done. |
| TACTILE OR MECHANICAL | This is done using No. 23 explorer with a force of 5 - 10 gm. |
| STIMULUS | |
| THERMAL STIMULUS | Using cold-water of varying temperature and heat test (Gutta percha, hot |
| | water) or blowing air from a distance of 1 cm. |
| OSMOTIC TEST | Cotton applicator saturated with sucrose solution is applied for a period |
| | of 10 seconds. |
| SCRATCH DEVICE | In this, stainless steel wire moves along the highest arc of curvature on the |
| | facial surface of the sensitive tooth. Scratching force could be increased |
| | by a screw. A tooth that fails to respond at 80 centinewtons is said to be |
| | nonsensitive. |
| YEAPLE PROBE | It is a pen-like device that was introduced in 1990. It contains a hand- |
| | piece with a probe tip and electronic control unit that allows the force |
| | of 0.05 - 1 N. |

 Table 1: Methods to assess Dentinal Hypersensitivity



- Pulpal response to caries and to restorative treatment.
- Inappropriate application of various medicaments during cavity floor preparation.
- Lack of care while contouring restorations so the tooth is left in traumatic occlusion.
- Palatogingival groove and other enamel invaginations.
- Chipped teeth causing exposed dentine.
- Vital bleaching

Preventive Management Strategies for Dentine Hypersensitivity

Dentine hypersensitivity results from dentine exposed from either coronal or radicular regions of the

tooth. Preventive measures must therefore be primarily aimed at reducing the risk of exposing dentine either as a result of the removal of enamel, usually caused by erosion, or the removal of cementum, most often attributed to either overzealous tooth brushing in a healthy mouth.

Exposure of Dentine as a Result of Loss of Cementum

Gingival recession is a common feature of both in populations with high standards of oral hygiene as well as in populations with poor oral hygiene which is seen predominantly on the buccal surfaces of teeth. The latter type of recession is seen in periodontal patients both exhibiting the disease and treatment. Recession linked to periodontal disease is often termed

Table 2: Management of Dentine Hypersensitivity

PERIODONTAL TREATMENT

CLINICAL EVALUATION

- Periodontal disease or periodontal treatment as the primary cause of exposure of dentine and associated dentine hypersensitivity.
- Check and monitor periodontal health
- Use of pain scores to assess and monitor dentine hypersensitivity.

PATIENT EDUCATION

- ✤ Reinforce the need for good oral hygiene
- Show patient the site affected by periodontal disease and explain probable cause of the exposed dentine
- Guide the patient to improve at home oral hygiene regimen
- Instruction on measures of reducing periodontal risk factors (eg diabetes, smoking, obesity)

INITIAL PHASE

Non-surgical periodontal Therapy

RE-EVALUATION

Follow-up assessment on periodontal status and dentine hypersensitivity

CORRECTIVE PHASE

 Surgical periodontal procedure: Guided Tissue Regeneration, Coronally Advanced Flap+ Enamel Matrix Derivatives, Connective Tissue Graft, Free Gingival Graft

FOLLOW UP MANAGEMENT MAINTENANCE PHASE

- Supportive periodontal therapy
- Ongoing monitoring of periodontal health
- Dentine hypersensitivity treatment (including desensitizing polishing pastes/fluoride varnishes)
- ✤ Advice Oral hygiene instructions



root sensitivity. Gingival recession identifying tooth brushing as an etiological factor, making the evidence circumstantial rather than factual teeth and tooth surfaces that receive most brushing during the brushing cycle overall show the highest predilection for recession with a more common incidence on the left side where a high majority of subjects are right-handed. It has been suggested that recession will increase over time with the use of abrasive toothpastes, tobacco and frequent brushing with or without toothpaste. Tooth brushing appears to be intimately linked to recession associated with dentine hypersensitivity.

Clinical Management of Dentine Hypersensitivity Gillam et al²²

Accurate diagnosis and preventive actions are crucial for the successful treatment of hypersensitivity and this need to be supplemented with long-term monitoring to address the specific requirements of these patients. Based on the current understanding of the underlying causes and development of hypersensitivity, such as the concept of lesion localization and initiation, it is important to identify the risk factors that contribute to different aspects of the disease. For each patient, an individualized risk profile can be established. The primary strategies for managing Dentinal hypersensitivity include:

- 1. Patient education and behaviour modification
- 2. Non-invasive treatments for occluding dentin tubules and relieving pain associated with hypersensitivity
- 3. Restorative or surgical treatments for the management of dh along with restoration of associated tooth structure and soft tissue loss.

NEWER AGENTS FOR THE MANAGE-MENT OF HYPERSENSITIVITY

- Casein-phosphopeptide-amorphous calcium phosphate (CPP) - (ACP) - A minimum of 6 weeks of topical application is recommended. It prevents the dissociation of calcium and phosphate ions and maintains their availability.²³
- Pro-Arginine Technology Arginine being positive charge binds to negatively charged tubule. It plugs and seals the tubule and makes them resistant to acid. Usually, the effect lasts for a minimum of 28 days.²⁴
- Nanomaterials It includes material with a

dimension less than 100 nm. This works by occluding the tubule and lasts a minimum of 7 days. The agents from this group include nanostructure bioactive glass, NovaMin, nanohydroxyapatite.²⁵

- Others Portland cement, Propolis, etc. However, many times these agents fail to provide relief. In such scenarios, root canal treatment is considered as the last resort for relief of pain
- Laser Treatment in Dentin Hypersensitivity - Laser therapy was first introduced as a potential method for treating dentinal hypersensitivity in 1985. The laser, by interacting with the tissue, causes different tissue reactions, according to its active medium, wavelength and power density and to the optical properties of the target tissue. In order for a laser to actually alter the dentin surface, it has to melt and resolidify the surface. This effectively closes the dentinal tubules. Laser treatment reduces sensitivity by coagulation of protein without altering the surface of the dentin Pashley et al suggests that it may occur through coagulation and protein precipitation of the plasma in the dentinal fluid or by alteration of the nerve fiber activity.²⁶ The study by McCarthy et al. indicates that the reduction in hypersensitivity could be the result of alteration of the root dentinal surface, physically occluding the dentinal tubules.27

Effectiveness of Various Laser Types in the Treatment of dentine hypersensitivity

- The lasers used for the treatment of dentine hypersensitivity are divided into two groups:
- Low output power (low-level) lasers [(He-Ne) helium-neon and (GaAlAs) galliumaluminum arsenide (diode).
- Middle output power (Carbon Dioxide Laser (CO₂), neodymium- or erbium-doped yttriumaluminum garnet (Nd:YAG, Er:YAG lasers) and erbium, chromium doped: yttrium, scandium, gallium and garnet (Er,Cr:YSGG).

CONCLUSION

Dentinal hypersensitivity is a common problem affecting over 80 % of the general population wide-



spread oral problem which affects people of variety of age groups. The evidence reviewed indicates that much has been learnt about dentine hypersensitivity since it was described as an enigma some 20 years ago. A great deal still remains to be discovered, however, and there are only very limited data derived from controlled clinical trials. Management strategies in particular have little scientific support and are based on what is known about the lesions of dentine hypersensitivity, the mechanism of stimulus transmission and the condition's etiology. Dentine hypersensitivity, both in the localization of lesions and certainly in the initiation of symptoms, has all the hallmarks of a tooth-wear phenomenon. Gingival recession probably accounts for most cervical dentine exposure but remains an under-researched and poorly understood process.

REFERENCES

- Johnson RH, Zulqar-Nain BJ, Koval JJ. The effectiveness of an electro-ionizing toothbrush in the control of dentinal hypersensitivity. J Periodontol. 1982 Jun;53(6):353-9.
- Holland GR, Narhi MN, Addy M, Gangarosa L, Orchardson R. Guidelines for the design and conduct of clinical trials on dentine hypersensitivity. J Clin Periodontol. 1997 Nov;24(11):808-13.
- 3. West NX. Dentine hypersensitivity: preventive and therapeutic approaches to treatment. Periodontology 2000. 2008 Oct 1;48(1).
- Zero DT, Lussi A. Erosion--chemical and biological factors of importance to the dental practitioner. Int Dent J. 2005;55(4 Suppl 1):285-90.
- Gillam DG. Management of dentin hypersensitivity. Curr Oral Health Reps 2015; 2: 87–94
- Flynn J, Galloway R, Orchardson R. The incidence of 'hypersensitive' teeth in the West of Scotland. J Dent. 1985 Sep;13(3):230-6.
- Graf H, Galasse R. Morbidity, prevalence and intraoral distribution of hypersensitive teeth. J Dent Res. 1977;56(2):162-5.
- Dababneh RH, Khouri AT, Addy M. Dentine hypersensitivity—An enigma? A review of terminology, mechanisms, aetiology and management. British dental journal. 1999 Dec;187(11):606-11.
- Chabanski MB, Gillam DG. Actiology, prevalence and clinical features of cervical dentine sensitivity. J Oral Rehabil. 1997 Jan;24(1):15-9.
- Rapp R, Avery JK, Strachan DS. Possible role of acetylcholinesterase in neural conduction within the dental pulp. In: Finn B, ed. Biology of the dental pulb organ. A symposium. Birmingham: University of Alabama Press 1968:309-25.
- 11. Drisko C. Oral hygiene and periodontal considerations in preventing and managing dentine hypersensitivity. International Dental Journal.

2007 Dec;57(S6):399-410.

- 12. Bartold PM. Dentinal hypersensitivity: a review. Australian dental journal. 2006 Sep;51(3):212-8.
- Smith RG. Gingival recession. Reappraisal of an enigmatic condition and a new index for monitoring. J Clin Periodontol. 1997 Mar;24(3):201-5.
- Irwin CR, McCusker P. Prevalence of dentine hypersensitivity in a general dental population. Journal of the Irish Dental Association. 1997 Jan 1;43(1):7-9.
- Bartlett DW, Shah P. A critical review of non-carious cervical (wear) lesions and the role of abfraction, erosion, and abrasion. Journal of dental research. 2006 Apr;85(4):306-12.
- Addy M. Tooth brushing, tooth wear and dentine hypersensitivity—are they associated?. International dental journal. 2005 Aug 1;55:261-7.
- 17. Smith BG, Robb ND. The prevalence of toothwear in 1007 dental patients. Journal of Oral Rehabilitation. 1996 Apr;23(4):232-9.
- Ferrari M, Cagidiaco MC, Monticelli F, Kugel G, Barker ML, Gerlach RW. Daytime use of a custom bleaching tray or whitening strips: initial and sustained color improvement. American Journal of Dentistry. 2007 Sep 1;20(I):19A.
- Que K, Ruan J, Fan X, Liang X, Hu D. A multi-centre and crosssectional study of dentine hypersensitivity in China. Journal of clinical periodontology. 2010 Jul;37(7):631-7.
- Von Troil B, Needleman I, Sanz M. A systematic review of the prevalence of root sensitivity following periodontal therapy. Journal of clinical periodontology. 2002 Dec;29:173-7.
- Rees JS, Addy M. A cross-sectional study of dentine hypersensitivity. J Clin Periodontol. 2002 Nov;29(11):997-1003.
- Gillam DG, Chesters RK, Attrill DC, Brunton P, Slater M, Strand P, Whelton H, Bartlett D. Dentine hypersensitivity–guidelines for the management of a common oral health problem. Dental update. 2013 Sep 2;40(7):514-24.
- Cai F, Shen P, Morgan MV, et al. Remineralization of enamel subsurface lesions in situ by sugar-free lozenges containing casein phosphopeptide-amorp-hous calcium phosphate. Aust Dent J 2003;48(4):240-3.
- Cummins D. Recent advances in dentin hypersensitivity: clinically proven treatments for instant and lasting sensitivity relief. Am J Dent 2010;23(Spec No A):3A-13A.
- Wang L, Magalhães AC, Francisconi-Dos-Rios LF, et al. Treatment of dentin hypersensitivity using nanohydroxyapatite pastes: a randomized three-month clinical trial. Oper Dent 2016;41(4):E93-101.
- Orchardson R, Gangarosa LP Sr, Holland GR, Pashley DH, Trowbridge HO, Ashley FP, Kleinberg I, Zappa U. Dentine hypersensitivity-into the 21st century. Arch Oral Biol. 1994;39 Suppl:113S-119S.
- McCarthy D, Pearson GJ, Palmer G, Gillam D. The Effects of Laser Radiation on Exposed Dentine Surfaces in the Treatment of Dentine Sensitivity. An In Vitro Study. ES Journal of Dental Sciences. 2020 Dec 30.

INFORMATION TO AUTHORS

About the Journal

JSPIK accepts articles from dentists, dental specialists (any speciality) and students. The articles submitted must have relevance to the speciality of Periodontics. Authors are encouraged to submit research papers, interdisciplinary case reports, interesting case discussions, letters to editor review articles or short communications.

Manuscripts

Articles should be type written on one side of A4 size (21x28cm) white paper in double spacing with a sufficient margin. Use a clear and concise reporting style. SPIK reserves the right to edit, manuscript, to accommodate space and style requirements. A soft copy of the article also has to be send to the editor's email: editorspik@gmail.com

Title Page: Title page should include the title of the article and the name, degrees, positions, professional
affiliations of each author. The corresponding authors, telephone, e-mail address, fax and complete mailing
address must be given.

 Abstract: An abstract of the article not exceeding 200 words should be included with abbreviated title for the page head use. Abstract should state the purpose of the study, investigations, basic procedures and the main findings. 4 key words of article should be mentioned below the abstract.

 Tables: Tables should be self explanatory, numbered in roman numbers, according to the order in the text and type on separate sheets of paper.

Illustrations: Illustrations should be clearly numbered and legends should be typed on a separate sheet of
paper, while each figure should be referred to the text(figure 1,2 etc.)

 Reference: Reference should be selective and keyed in numerical order to the text in Vancouver Style (not alphabetical). Type them double spaced on a separate sheet of paper. Journal references must include author's names, article title, journal name, volume number, page number and year. Book reference must include author's or editor's names, chapter title, book title, edition number, publisher, year and page numbers.

Copy right

Submission of manuscripts implied that the work described has and not been published before (except in the form of on abstract or as part of published lectures, review or thesis) and it is not under consideration for publication else where, and if accepted, it will not be published else where in the same form, in either the same or another language without the comment of copyright holders. The copyright covers the exclusive rights of reproduction and distribution, photographic reprints, video cassettes and such other similar things. The views/opinions expressed by the authors are their own. The journal bears no responsibility what so ever. The editors and publishers can accept no legal responsibility for any errors, omissions or opinions expressed by authors. The publisher makes no warranty, for expression implied with respect to the material contained therein. The journal is edited and published under the directions of the editorial board/review panel who reserve the right to reject any material without giving explanations. All communications should be addressed to the Editor. No responsibility will be taken for undelivered issues due to circumstances beyond the control of the publishers.

Books for review

Books and monographs will be reviewed based on their relevance to SPIK readers. Books should be sent to the Editor and will become property of SPIK.

Article publication charges

There are no article publication charges for JSPIK. If the author wishes for print, processing fee shall be levied for hard copies of the journal depending upon the number of reprints asked for.

Subscription Rates

Free distribution for all the members of the SPIK.

Inland Subscription for non members and institutions : Rs. 1000 per issue, Rs. 3000 for 1 Year, Rs. 6000 for 2 years, Rs. 7500 for 3 years

Address for communication

Dr Shahana C Mohamed, Editor JSPIK, Assistant Professor, Department of Periodontics, Government Dental College, Medical College P. O, Thiruvananthapuram - 695 011, Kerala, India. E-mail: editorspik@gmail.com

SPIK ANNUAL CONFERENCE 2024

The 16th Annual Conference of SPIK was organized as two days National Implant Convention "All about implants" in association with Cochin Periodontists Society (COPS) and Indian Dental Association Kerala State branch, on 10th & 11th February 2024 at Hotel Renai Kochi, Ernakulam.

The programme started on 10th February 2024 with inaugural function at 10 am with collaring of the President by the Secretary followed by invocation. Dr. Arun Sadasivan, Organizing Chairman welcomed the gathering. Dr. Jose Paul, President SPIK presided over the function, Dr. Terry Thomas Edathotty, President IDA Kerala State inaugurated the programme. Dr.Mohammed Feroz.T.P, Secretary SPIK presented the Secretary's report, Dr. Bindu

Rachel, President COPS and Dr.Mathew Thomas, President Elect SPIK felicitated during the function. Dr. Presanthila Janam, Immediate Past President SPIK, Dr. Deepak Thomas, Secretary COPS, Dr. Siddharth,CDE Chairman IDA Kerala State, and Dr. Jayan Jacob Mathew graced the occasion. Dr.Rishi Emmatty, Organizing Scientific Chairman delivered the vote of thanks.

We received registration from life members of SPIK, COPS, IDA and Post graduate students from various institutions all over Kerala. A total of 390 delegates participated in the programme. Paper presentations for the Post graduate students were conducted online one week before the conference.

Scientific session included lectures and



Inaugural function





hands-on training and were as the following:

| Dr. BRR Varma Oration: Implantology – An integrated speciality | Dr. Abhay Kolte |
|---|---------------------------------------|
| Fundamentals of Implant treatment planning | Dr. Vinod Krishnan |
| Excellence in Anterior esthetics | Dr. Abhay Lamba |
| Implant Site development | Dr. Lalith V Anand |
| Implant Impression – Trial - Fit in lecture with workshop | Dr. Allen EH & Dr. Sreenath IR |
| The science of osseo integration & when to load implants | Dr. Sunitha Raja |
| Digitalisation in Implant dentistry | |
| Intra oral scanner workshop | Dr. George Abraham |
| Guided implant surgery | Dr. Lalith V Anand |
| Immediate implant procedure – Challenges & Solutions | Dr. Dhruv Arora |
| Implant Failure – Means and ways to avoid & manage | Dr. Sunitha Raja |
| Cortico – Basal implants (Lecture with hands-on) | Dr. Prasanth Pillai & Dr.Bobby Antony |
| Immediate loading single implant to Full mouth rehabilitation | Dr. Jaibin George |
| Remote anchorages & Sinus bypass for predictable implants | Dr. Prisly Thomas |
| Prosthetic options in Implant Prosthodontics (Impression to fit in lab technques) | Dr. Linna Benny |

The third (December) issue of Journal of Society of Periodontists and Implantologists of Kerala (JSPIK) 2023 was released by Dr. Terry Thomas Edathotty and newsletter of SPIK - Perio Implant Scan was released by Dr. Bindu Rachel during the conference. Executive committee meeting and annual general body meeting of SPIK was conducted after the scientific programme. New office bearers were installed under the able leadership of Dr. Mathew Thomas as the President. Meeting was adjourned at 8pm on 11th February 2024.







Awarding of SPIK scholarship to Ms. Nighitha Christy K R by Dr Jose Paul



Dr B R R Varma Memorial Oration Lecture by Dr Abhay Kolte



D an pr



Hands-on session



Collaring of new President Dr Mathew Thomas by Secretary Dr Mohammed Feroz



Valedictory function



Office Bearers 2024-25

NATIONAL PERIODONTIST DAY 2024



National Periodontist Day (Decoding Perio) was organized and conducted by the Department of Periodontics, Mahe Institute of Dental Sciences and Hospital under the banner of Indian Society of Periodontics (ISP)and Society of Periodontists and Implantologists of Kerala on February 23,2024 with the theme "Say No to Bleeding gums". Series of programs were organized in the department from February 18 to 22,2024.

Reels competition and Adzap competition was organized for the undergraduates and interns on topics related to dentistry. There were around ten participants for the same. Doodling was organized for the undergraduates and interns. It was a highly competitive one with active participation from all the batches. Dr Nanditha Chandran, Dr DM Hemalatha and Dr Jilu Jessy Abraham, Readers of Department of Periodontics were the program coordinators. Patient education and a lecture on Oral hygiene and public interaction at Walk Way, Mahe was organized by the post graduate students on February 22,2024. Dental education kit consisting of tooth brushes and paste were

distributed to the participants. On February 23,2024, an official inauguration of the program was done by Dr Anil Melath, Principal, Professor and Head of Department followed by honouring of Dr BV Somayaji, Senior most Periodontist, Prof and Head, A B Shetty Memorial Institute of Dental Sciences, Mangalore.

